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GEOGRAPHY OF PLANTS.

“The hand that gives the angels wings,
And plants the forest by its power,
O'er mountain, vale, and champaign flings
The seed of every herb and flower :
Nor forests stand, nor angels fly,
More at God's will, more in his eye,
Than the green blade strikes down its root,
Expands its bloom, and yields its fruit.”

MONTGOMERY.

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P R E F A C E.

THE object of the following pages is to give a brief and popular view of that branch of botany and physical geography, which is commonly termed the Geography of Plants; a study which is yet in its infancy, but respecting which enough is known, both as to facts and laws, to render it one of no common interest. The mere enumeration of botanical *names* has been carefully avoided, especially in describing the floral features of foreign countries, where the mention of such plants as are generally unknown here would have been unintelligible without figures, or descriptions of a length precluded by the limits of the work. Such plants only, therefore, have been

selected in illustration, as would be generally known, or could be readily described.

Much assistance has been derived in the preparation of these pages from the works of of M. Meyen, Dr. Lindley, Mrs. Somerville, and Dr. Carpenter ; and to the works of the first of these authors and of baron Humboldt, the reader who desires further information is directed. Mr. H. C. Watson's "Cybele Brittanica" will also afford much instruction in regard to the geographical distribution of British plants.

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THE GEOGRAPHY OF PLANTS.

CHAPTER I.

Introduction—General view of the numbers and distribution of plants—Botanical districts—Centres of creation—Influence of soil and situation—Marine plants—Sargassum—Red Sea—Minute algæ—Fresh-water plants—Lotus—*Valisneria*—Spring and fountain plants—Oases—Maritime plants—*Barilla*—Mangrove—Steppes—Sand plants—Chalk plants—Bog plants—Mountain plants—Cultivated ground plants—Field and wood plants—Parasites and epiphytes—*Orchis* tribe.

AMIDST all the varied forms of beauty, and the marvellous displays of wisdom, with which a bountiful Creator has adorned our earth, the vast vegetable kingdom holds a prominent place. And surely none can survey the amazing variety and loveliness of the plants and trees which clothe this earth, and reflect on their immense importance, as furnishing food, clothing, medicine, and luxuries to man, and not be led at once to the acknowledgment that “the hand of the Lord hath wrought this.” It is, however, but too true, that many attempt

to trace the origin of plants to what is called "spontaneous or equivocal generation;" but, in spite of the vain effort to disavow and get rid of the idea of an all-wise and supreme Creator, there are multitudes of facts directly opposed to such views, which clearly exhibit the wonderful provision God has made in the vegetable creation for the wants, comforts, and enjoyments of our race, in so vast a variety of ways, that the Christian naturalist delights to trace the works of his heavenly Father's hand, to see his mercy and his goodness thus displayed to all his intelligent creatures, and to praise him for his goodness to the children of men.

It is not our purpose to enter into the general subject of botany, but to take up one of the branches of the science, which affords large scope for very interesting inquiries. The science may be considered as consisting of three principal sub-divisions or branches.

I. **PHYSIOLOGICAL BOTANY.**—This comprises investigations into the structure and organs of plants, (Vegetable Anatomy,) and their functions and uses, (Vegetable Physiology.) It forms a very interesting and instructive study.

II. **SYSTEMATIC BOTANY; or, CLASSIFICATION.**—The number of plants hitherto discovered on the surface of the globe is so immense, that without some kind of classification or arrangement, they would present an inextricable mass of confusion. Various methods have been proposed, two only of which have stood the test of

time, the Linnæan and the Jussæan, sometimes, though unfairly, termed the artificial and the natural methods; both are useful, the former having been aptly designated as "the grammar," the latter as "the literature" of the science, and both should be studied.

III. GEOGRAPHICAL BOTANY.—This, which will form the subject of our remarks, is the investigation into those laws which regulate the distribution of plants over the face of our globe; which assign a certain set of plants to one country, and a different series to another; or, which allow of one plant being so widely distributed over the various countries of our globe as almost to be called universal, while others are restricted to the narrowest limits.

It is estimated that the number of distinct species of plants, already known and described, is 92,930. This includes all the flowering plants, trees, and shrubs, ferns, mosses, lichens, sea and river weeds, (*Algæ*,) mushrooms and their allies, (*Fungi*,) in fact, every vegetable production. These are very variously distributed over our globe; light, heat, altitude, soil, situation, all contributing their influence in modifying the diffusion of species, and of these the first two are by far the most important. Near the equator, where light and heat are most intense, vegetation is most luxuriant and profuse; while at the poles, or at those high elevations which reach above the line of perpetual snow, or in the profounder recesses

of the ocean, vegetable life seems to become entirely extinct, and not a plant even of the simplest form appears. Between these extreme limits, however, every gradation is seen, according to the increase of latitude or height. The species which inhabit each particular district of our globe are just those best suited to the physical condition of each, and to the requirements of its inhabitants, whether of the human species or of the brute creation. Thus, the water-melon, the banana, the bread-fruit, and the rice-plant, are peculiar to tropical regions; while the vine, wheat, barley, and the common corn-plants, will not succeed in so high a temperature, but require a cooler climate. Many facts, which we shall have to notice, will exhibit to us the goodness of God in so arranging the vegetable productions of our globe, that not only (to a great extent) are the food-plants of the various countries exactly such as are best adapted to the wants of the inhabitants, but also that a vast variety of the more useful plants are so distributed as to induce commercial intercourse; and thus, while they render nations mutually dependent on one another for many of the comforts and conveniences of life, they are an indirect means of promoting the advancement of civilization, and, above all, of the spread of the gospel. Why, however, a certain species should only be able to flourish in a certain soil, and under a certain amount of heat and moisture, is a problem we cannot as yet solve; it doubtless depends on

special peculiarities in the internal structure ; but in what those peculiarities consist, we are ignorant.

Some plants, too, are very widely distributed. The daisy, for example, is spread throughout Europe almost universally, in Australia, in Northern Asia, in some parts of Africa, and in South America. In India and North America, however, it is entirely absent, and can only be preserved as a choice exotic, tended with the most zealous care in botanic gardens. The cereals, that is, wheat, barley, oats, rye, etc., are endowed with a very great power of adaptation. Though their native country is scarcely known, and they are rarely found wild, yet they possess a power of enduring such a variety of temperature, that they have been introduced by cultivation over a large portion of our globe. They can withstand the cold of 62° N. lat., and though they will not in general bear the heat of the tropics, yet even in such places they are sometimes cultivated during the winter season. The potato, again, though only known wild as a native of the western coast of South America, is now cultivated almost universally, particularly in Europe and North America, and has become one of the most important articles of food, especially among the poor.

On the other hand, many species (and probably the great majority of plants) are very limited in their abodes. The *Cactus* tribe, so generally cultivated in our green-houses, and so

remarkable for the singularity of their growth, the absence of leaves, and the splendour of their flowers, contains 800 species, all of which are peculiar to America, and not a single species is a native of Europe, Asia, or Africa. 533 species of the beautiful genus *Erica*, or heath, are found at or near the Cape of Good Hope, and nowhere else in the world. Most of the species of *Epacris*, (a heath-like plant with beautiful flowers,) and many species of *Protea*, *Mimosa*, *Eucalyptus*, *Banksia*, and several others, which ornament our green-houses and hot-houses, and whose singular foliage and beautiful flowers caused captain Cook to give the name of Botany Bay to the well-known place which still bears it, are peculiar to Australia. The species of *Cinchona*, too, which yield the Peruvian bark, grow only on the eastern declivity of the Andes, as far as 18° s. lat. ; and the cedar of Lebanon is indigenous to that mountain alone. It would be easy to multiply instances, but this is needless.

These facts will enable us readily to understand, that there are numerous botanical districts on the surface of our globe, each of which has its own vegetation, a considerable number, perhaps the majority of the species, being peculiar to the particular district, while others are found in common with other localities. Very often these districts contain whole families of plants found nowhere else ; and even of genera which inhabit other countries, the species are different ; perhaps, in similar cir-

cumstances, representative, but not identical. Thus, the Flora of the United States of North America is totally different from that of Europe, even in places where the annual temperature is the same. Of 2,891 species of flowering plants found in the United States, only 385 are common to them and the corresponding latitudes of Europe. In St. Helena, of thirty flowering plants, only one or two are native elsewhere. In the Galapagos islands, out of 180 plants which have been collected, 100 are found nowhere else; and of twenty-one species of composite plants, all but one are peculiar to that group. Some few species make the most remarkable leaps, being common to countries at a great distance from each other, while absent, or nearly so, from the intervening ones. Thus, in the Falkland Islands, more than thirty plants, natives of Britain, are found wild. The common quaking-grass (*Briza media*) has been found in the interior of the country at the Cape of Good Hope; and almost all the lichens brought from the southern hemisphere by sir James Ross, amounting to 200 species, are found in the northern hemisphere, and chiefly in Europe. Several of our commonest plants, as the bull-rush, (*Typha angustifolia*,) the reed, (*Arundo phragmites*,) the marsh-mallow, (*Althæa officinalis*,) the bird's-foot trefoil, (*Lotus corniculatus*,) the knot-grass, (*Polygonum aviculare*,) with several others, are found again in Australia. For this various distribution of plants it is difficult to account. A recent theory, which has been ably advocated

by professor E. Forbes, supposes that plants were originally created in certain spots, (called "centres of creation,") each containing its peculiar group of species, and that from these spots they have become gradually diffused; the extent of such diffusion depending partly on the peculiar adaptation of the plants themselves, and also being in many cases very much modified by geological changes. We are not, however, prepared to subscribe to this theory, however ingenious; a much larger array of facts must be produced in its support before it can claim to be regarded as a truth. We should rather be inclined to say, with one of our poets,

"Jehovah spake—
And Earth, an infant, naked as she came
Out of the womb of Chaos, straight put on
Her beautiful attire, and deck'd her robe
Of verdure with ten thousand glorious flowers,
Exhaling incense; crown'd her mountain-heads
With cedars, train'd her vines around their girdles,
And pour'd spontaneous harvests at their feet."

In entering somewhat more at large into this subject, we will consider separately the influence of situation, climate, and attitude. First, then, as to **SITUATION** and **SOIL**.—These materially influence the distribution of plants. Some require a moist soil—others a dry one: some a high elevation—others are found only in the plains: some in the clefts of rocks—others in the richest pastures—others only in sandy wastes: some grow immersed in the ocean—others are on dry walls and roofs. The southern slope of a hill is generally clothed with different plants to

those on its northern side ; a chalk district presents an array of vegetation greatly differing from that of a clayey soil ; which, again, as widely differs from pastures in the immediate neighbourhood of the sea. Vines cannot flourish in a soil which does not supply them with potash ; neither can peas, beans, nor plants used as dyes, reach perfection without the same ingredient. The corn plants require a soil containing both potash and the earthy phosphates ; nor can any of the grasses flourish without silica, which gives its hard coating to straw, and to so great an extent is it absorbed by them, that hard masses of vitrified silicious matter have been found where a wheat or hay-stack has been destroyed by fire ; and the hollow tubes of the bamboo often contain solid flinty lumps, called in India "*Tabasheer*." Plants of the cruciform order (as mustard, turnips, etc.) contain sulphur, and require it in a soil in which they can flourish. In fact, most plants have their peculiarities in this respect, and often there is a marked difference in the trees growing on the same mountain, depending on the nature of the rock beneath.

Let us now take a glance at the various *habitats*, (as they are termed by botanists,) and the chief plants which occupy them.

Marine plants are those which are found in sea-water, and therefore in every ocean. It is not to be supposed that plants grow indifferently at any depth in the sea ; it is probable that they will not exist at a greater depth than

a few hundred feet. The depth of the ocean varies very greatly, and animals and plants are alike absent from its deeper parts. The plants included under the name of marine plants are the immense family of *Algæ*, or sea-weeds, and the single genus of flowering plants, termed *zostera*, or grass wrack, of which we have two native species existing in our British seas, one of which is extremely abundant. Most of the marine plants are rooted on the bottom of the sea, or on rocks, or even on other sea-weeds, chiefly in shallow water, and must, therefore, derive all their nourishment from the sea-water and the air it contains. There are exceptions to this, such as in the sea-weed now called *Sargassum vulgare*. This very remarkable plant forms beds of vast extent over a space in the Atlantic Ocean, which is called the Sargasso Sea, (*Mar de Zargasso* of the Portuguese,) and which extends from 22° to 36° N. lat., and from 25° to 45° W. long., an area equal to 40,000 square miles, or the whole of France. So vast are some of these beds of sea-weed, that Columbus, who met with them in his first voyage westward, in which he discovered the western hemisphere, compared them to floating meadows. Their occurrence induced him to expect the vicinity of land long before the realization of his hopes and predictions, and enabled him for some time to repress the mutinous disposition of his wearied and dispirited seamen. It is singular that this sea-weed has never been found with either root or fruit, and

in small specimens it is easily seen that they have grown in all directions from a central point, which never has been fixed.

A sea-weed, common in the North Sea, (*Chorda filum*,) is frequently found of the length of thirty or forty feet. In Scalpa Bay, in Orkney, this plant forms meadows, through which a pinnace can with difficulty force its way. On the western coasts of the British Channel, there are permanent bands or masses of this sea-weed, lying in the direction of the currents, not more than six hundred feet wide, but fifteen or twenty miles in length. Another species (*Lessonia fuscescens*) is, we are informed, twenty-five or thirty feet long, with a trunk as thick as a man's thigh, and with numerous branches, from which long leaves droop into the water like willows. There are immense submarine forests off Patagonia and Terra del Fuego, attached to the rocks at the bottom. These plants are so strong and buoyant that they bring up large masses of stone; and as they grow slanting, and stretch along the surface of the sea, they are sometimes three hundred feet long. The quantity of living creatures which inhabit these submarine forests, and the parasitical weeds attached to them, is inconceivable—they absolutely teem with life. But for gigantic size, the prodigious ponds of a species (*Macrocystis pyrifera*) found about Cape Horn, and in the Straits of Magellan and Le Maine, exceed all others. Specimens have been measured which exceed three hundred

feet in length, and it is said to grow even to the length of fifteen hundred feet. Its leaves are long and narrow, and at the base of each is placed a vesicle filled with air, which assists to support its enormous length in the water. It exists in detached masses, like green meadows, in every latitude, from the South Polar Ocean to the 45th degree of N. lat. in the Atlantic, and to the shores of California in the Pacific, where there are fields of it so impenetrable, that it has saved vessels, driven by the heavy swell towards the shore, from shipwreck. It is never seen where the temperature of the water is at the freezing point. This, with another species, (*Laminaria radiata*,) also of gigantic size and extensive range, forms part of a band of seaweed that girds Kerguelen's Island so densely that a boat can scarcely be pulled through it. They are found, too, in great abundance on the coasts of the Falkland Islands, and also in vast fields in the open sea, hundreds of miles from any land.

The colour of the Red Sea is said to be owing to its sea-weeds. Dupont gives the following statement: "On the 8th of July, 1843, I entered the Red Sea by the Straits of Babelmandel, on board the 'Atalanta' steamer. On the 15th, the burning sun of Arabia awoke me by its brilliancy, unannounced by the dawn. I was leaning mechanically out of the poop windows, to catch a little of the fresh air of night before the sun had devoured it, when, imagine my surprise to find the sea stained red as far as the eye could reach behind the vessel.

If I were to attempt to describe this phenomenon, I would say that the surface of the ocean was entirely covered with a thin, close layer of fine matter, the colour of brick-dust, but slightly orange. Mahogany saw-dust would produce such an appearance. When put into a white glass bottle, it became in the course of a day deep violet, while the water itself had become a beautiful rose-colour. 'This appearance lasted for about a day and a half, after which the sea became blue as before. During this time we must have passed through about two hundred and fifty-six miles of the red plant." Off Bahia, on the coast of Brazil, bands, several miles long, occur, of a species like chopped hay. But some of the minute sea-weeds are the most marvellous. In the Antarctic Ocean vast multitudes of one of the *Diatomaceæ* occur, so minute as to be invisible to the naked eye, and yet swarming in such countless myriads as to give the sea a pale ochreous brown colour.

The thought of such numbers confounds the mind. On their first discovery they were thought to be animalcules of the silicious shelled kind, but they are now ascertained to be vegetables. They augment in quantity as the latitude increases, up to the highest point attained by man; and from the 165th to the 160th degree of west longitude, between the 76th and 78th parallels of south latitude, the hard remains of this vegetable are forming a submarine bank, from two to three hundred miles long, and of great

breadth—a marvellous instance of great ends from small means. It forms one among many instances of that omnipotent Power, which can, out of (apparently) the most insignificant things, produce vast results; and reminds us that in providence and grace, as well as in nature, vast results often proceed from seemingly trivial causes. What an idea, too, does so amazing an amount of being conveyed of eternity! The mind is utterly overwhelmed in attempting to conceive of the number of plants buried in even a small portion of such a mass, and yet, vast as such myriads are, they are nothing to the *ages* of eternity! We have thus mentioned some of the most remarkable marine plants, but few persons can have walked on any of our shores, and not had their attention attracted by the extreme beauty of many of our native sea-weeds, of every shade and hue, from the delicate green of many of the *confervæ*, to the brilliant red and purple of others.

Fresh-water plants are such as grow in fresh-water only. These are of vastly more varied forms than the marine species. The large order of *algæ*, which we just remarked abounds in the sea, has its representatives also in fresh-water; these principally belong to the *confervæ*, a section of the *algæ* with which, by name, perhaps, but few are acquainted, though the plants themselves are familiar to most. Who is there that has not observed, in a stagnant ditch or pond, masses of green matter, frequently in the form of very fine hair, or covering the surface of the water

with a greenish slime? If now a minute portion of this matter be taken on a slip of glass, spread out with a drop of clear water, and then placed beneath a good microscope, it will be found to be composed of an assemblage of plants, often exceedingly elegant and beautiful in their structure. The number of species of *confervæ* and the allied genera is very great, probably not less than six hundred. Their propagation is often exceedingly rapid, perfect plants being often entirely reproduced in from twenty-four to forty-eight hours. Ponds, which have been entirely cleared of *confervæ* one day, have become quite covered by them the next.

In tropical countries, the *confervæ* are very rare, though not altogether absent. The duckweed (*Lemna*) is an extremely common and well-known fresh-water plant; four species of it inhabit England, two of which have also been found in America and Australia. It is general throughout temperate climates. In tropical countries, the duck-weeds cease, and are replaced by a larger plant, with flowers and leaves, (*Pistia stratiotes*,) which covers many of the tropical lakes in incredible quantities. When there have been storms on the Laguna de Bay, the great lake in the island Lueon, these plants are thrown on the coasts, and not only cover the edges of the water, but form heaps several feet high on the shore, and spread a dreadful stench while decaying. The same plant grows abundantly in the water-tanks in Jamaica, and is said, by the acrid properties

it communicates in hot, dry weather, to give rise to dysentery among those who make use of the water. Among fresh-water plants, we should hardly forget to notice the pretty yellow water-lily, (*Nuphar lutea*,) and its still more beautiful relative, the white water-lily, (*Nymphaea alba*,) whose lovely pure white blossoms and handsome floating leaves delight the eye of many an observer. A tropical species, (*Nelumbium speciosum*,) formerly common in Egypt, but now said to be extinct there, though still abounding in the placid waters of India and Thibet, where it is held sacred, is remarkable for the beauty of its fragrant rose-coloured flowers, which somewhat resemble those of the water-lily, but rise out of the water, while the circular leaves, often two feet broad, float on the surface. It is found also in one spot near Astrakhan, but nowhere else in the vast empire of Russia. This flower is believed to be the "lotus" of the ancient Egyptians, and is often represented on the monuments both of that country and India.

An interesting British aquatic, (*Stratiotes aloides*,) commonly called water-soldier, from its sword-like leaves, remains beneath the water during the greater part of the year, but at its time of flowering raises itself to the surface, by means of which the fructifying pollen is scattered upon the stigmata. After flowering, the plant sinks again. A still more curious means of effecting the same object is found in the *Vallisneria*, a foreign plant, which grows in

rivers and rapid streams, the Rhine for example. In this plant, the stamens and pistils grow in different flowers, though on the same plant. The pistil-bearing flowers are themselves lighter than water, and are placed at the end of a long spiral stalk, so that while in flower the stalk contracts or extends much in the manner of a bell-spring, that it may always keep the flower on the surface of the water. No such provision is made for the stamen-bearing flowers, which remain submerged up to the time of the pollen being matured ; as soon as this is the case, the flowers become detached, and rise to the surface, where they scatter their pollen as they float along, and thus the pistilliferous flowers become fertilized. Many of our most beautiful wild flowers in England are among the fresh-water plants. We must just stay to name the water violet, (*Hottonia palustris*,) the flowering rush, (*Butomus umbellatus*,) the frog-bit, (*Hydrocharis morsus ranae*,) the water speedwell, (*Veronica anagallis*,) the arrow-head, (*Sagittaria sagittifolia*,) and the white water crowfoot, (*Ranunculus aquatilis*, and *R. circinatus*.)

Spring and fountain plants may be distinguished from the last as growing in the clear, fresh water of springs, or close to them. The little water chickweed, (*Montia fontana*,) and the brooklime speedwell, (*Veronica beccabunga*,) are examples of this kind of plants, which are, or may be, familiar to every one. Even hot springs are not destitute of vegetation. In Iceland, many plants grow close to the hot

springs ; some not far from the edge of the Great Geyser, where every other plant is petrified ; and species of *conferve* flourish in a spring, said to be almost hot enough to boil an egg. The influence of springs on the surrounding vegetation is also great, especially in the tropics. In deserts, the smallest spring forms in those climates an oasis, in which grasses, juicy cyperi, and bushes grow, and even here and there a palm rises. In the barren, sandy, and parched-up deserts of the south of Peru, between the Cordilleras and the coast, a spring, however small, which rises often at wide intervals, is the cause of a little settlement. "Often it supports only a field of lucerne, a little maize field, and a few olive trees ; and yet, for the sake of this scanty produce, the great roads must pass by such places, that the beasts of burden may get the refreshment necessary for them. Nothing can equal the dreariness and death-like stillness in such regions of south Peru. Sometimes, for twenty or thirty miles, not a bird, not an insect, nor a plant is seen ; but the smallest spring calls from this dead, dusty soil, a green oasis ; and when rich mines are near, is the source of great wealth, which could not be obtained without it."

Maritime plants are such as choose especially for their localities places within the influence of sea-air, or actually on the sea-coast. A beautiful little plant, with deep green leaves, and pretty little pink flowers, the saltwort, (*Glaux maritima*,) abounds in damp, turfy spots, near

the shores of our own country ; and in similar spots the handsome purple sea-lavender is to be seen in abundance. On the coasts of the Mediterranean, two fleshy-leaved plants, with inconspicuous flowers, (*Salsola kali*, and *Salsola soda*,) are found in great abundance, and are burned in large quantities for the sake of their ashes, which contain much soda. These, when packed in barrels, are imported into this country under the name of Barilla, which was formerly used extensively in various manufactures, especially that of soap, and is still to some extent, though mostly superseded by the use of soda manufactured from common salt.

On the sea-coasts of tropical climates, where the shores consist of mould, partly firm and partly marshy, and which are accessible to the tide, and often covered by it, vast forests occur, which frequently extend for miles along the coast. In the West Indies, South America, and the west coast of Africa, these consist of the mangrove, (*Rhizophora mangle*.) This is a very curious tree, seldom exceeding forty or fifty feet in height, and is green through the year. Unlike most other trees, its roots are not all under ground, but the lower portion of the stem divides into roots at a considerable height above the soil, and these again subdivide, so as to form a complete vault of roots, from the summit of which the trunk springs. The tree is thus more firmly and extensively fixed in the loose, swampy ground, in which it flourishes. It differs from other plants also in another remark-

able particular. It is well known, that the seeds of most plants do not germinate or commence growing till placed in the ground, and warmth and moisture induce the germ to sprout. But the seeds of the mangrove germinate as they hang upon the tree, and push forth a rootlet, which gradually lengthens until it reaches the marshy surface below ; or, if too high on the tree for this, after pushing out to a considerable length, it drops from the tree ; the thick pointed root fixes itself in the mud, and leaves immediately spring from the opposite extremity. In this way, so dense a forest is formed, in a few years comparatively, from a single trunk, that the foliage entirely intercepts the rays of the sun, and, preventing the exhalation of the foul vapours that arise from the marshy surface beneath, becomes one of the most unhealthy places in a tropical climate ; indeed, so pestilential are many of the forests, as to render it almost certain death to botanize among this luxuriance of nature. The network of roots of such a spot intercepts and collects all the solid matters brought down by the rivers at the mouth of which these are often found, not only on the marsh, but often growing so far into the water that their trunks are covered with shell-fish. They not only thus extend along the coast, but actually in many instances form new ground for themselves, and as a large part of this consists of decomposing vegetable matter, under the heat of a tropical sun, pestilential vapours are continually arising, rendering it

peculiarly dangerous to human beings. The surface of the ground of a mangrove swamp is so soft as to render it unsafe for human feet ; nevertheless, the savage natives pass over it, leaping from root to root for miles, without once daring to trust their weight upon the treacherous soil beneath.

In Asia, a maritime soil prevails very extensively, and forms some of those vast plains called steppes, a large extent of which is strongly impregnated with salt, and here only maritime and saline plants will flourish. These steppes extend over a space of about a million square miles, exclusive of the extensive frozen marshes of the north of Siberia, and extend from the Sea of Azov and the Ural Mountains on the west, to the little Altai Mountains and the Lena on the east. The vegetation upon them consists of comparatively few species, and those are stunted ; among the most conspicuous are the sea lavender, (*Statice tatarica*,) a species of salt-wort, (*Salsola prostrata*,) some species of liquorice, (*Glycyrrhiza hirsuta*, and *G. lævis*,) the latter the liquorice-root of our shops, with some others. On our own shores, the eryngo, (*Eryngium maritimum*,) with its beautiful blue heads of flowers and bluish-white foliage, forms a striking object.

Sand plants are those which thrive, alone or nearly so, in silicious sand. They are of a peculiar character in all parts of the world, and the greater number are probably grasses and their allies. Three of these plants especially, the

sand-reed, or marrams, (*Ammophila arenaria*,) the sand-sedge, (*Carex arenaria*,) and the sea lime-grass, (*Elymus arenarius*,) have been especially useful in restraining the encroachments of the sea on sandy shores. This they do by their long, creeping shoots and tough, tangled roots, which, running among the sands in every direction, so bind them together, that they offer a resistance rarely overcome by the force of storms, and are renewed as fast as they are destroyed. When these natural defences have been uprooted by the thoughtlessness or ignorance of man, the most serious evils have arisen. In Scotland, for example, large tracts of once fertile country have been rendered barren by the encroachment of sand-hills, which have given them the desert-like aspect of Egyptian plains; and this encroachment has resulted from the destruction of the mat-grasses, which were pulled up by the country people for fuel to such an extent, that an act of parliament was passed, about one hundred years ago, rendering it punishable to do so.

Chalk plants grow on calcareous soils. Among these may be enumerated many of our prettiest wild plants in England, as the yellow wort, (*Chlora perfoliata*,) the squinancy wort, or small woodruff, (*Asperula cynanchica*,) and most of our native species of the orchis tribe, which adorn many a chalky spot with their beautiful flowers. One considerable genus of plants (*Gypsophila*) is only found on rocks composed of gypsum, or sulphate of lime.

Turf, bog, and marsh plants are found in great variety in our own country, and they abound in foreign lands. The sundew, (*Drosera*), of which we have three native species, is a common inhabitant of spongy bogs, and may serve as an example. Its leaves, disposed in a circle around the root, are of a beautiful reddish colour, and are covered with numerous long hairs, standing erect, and when the sun shines bright and warm, each hair is tipped with a transparent globule of viscid matter. Let any poor fly or other insect alight upon one of these leaves, and if not powerful enough immediately to escape, it becomes entangled in the viscid secretion, and then the hairs gradually bend over it, and bind it down to die. In some of the swamps of Carolina, in North America, is found the Venus's fly-trap, (*Dionaea muscipula*), which presents a remarkable analogy to this plant. Its leaves are furnished with a row of teeth, or rather bristles, on each side, and so irritable is the leaf, that if touched by any substance, or especially if an insect alights upon it, the sides instantly collapse, the teeth lock one into another, like the teeth of a rat-trap, and cannot be separated again without force. Another beautiful plant, which abounds on moory ground, especially in the north of England, is the cotton grass. The seeds of this plant (which grow together in heads) are surrounded as they ripen by a number of fine hairs, of a pure white colour and beautiful silky texture, so that, when ripe, the spike pre-

sents an elegant tuft of silvery hairs. Their structure unfits them for weaving into any fabric, but in the northern counties of England and Scotland they are much used by the poor for stuffing pillows.

Rock and gravel plants. These generally grow on bare rocks or dry gravel; the cactus and stoncrop tribes, many of the ferns, lichens, and mosses, are examples. In the gravel which is formed by the action of mountain-torrents, especially at lofty elevations, are found some peculiar plants, such as *Ranunculus glacialis*, which adorns heights otherwise barren, and bordering on the regions of perpetual snow. Here we may also mention *mountain plants*, which, as their name implies, grow especially on mountain ranges. Their number is very great, though numbers of species which are sometimes found on mountains cannot properly be said to be mountain plants, as will be seen when we come to speak of the influence of altitude. One example will suffice at present. On the Himalayan mountains, at the height of from five thousand to nine thousand feet above the level of the sea, the vegetation assumes a perfectly European aspect. Though situated in a tropical country, the great elevation produces such a diminution of temperature, that at that height the climate resembles that of our own country, and the plants are also very similar. The dandelion, the ivy, our common meadow grasses, (*Poa annua* and *Alopecurus geniculatus*), cleavers, (*Galium aparine*), and a number

of other common English plants, abound there.

Cultivated ground plants are those which appear in spots in which other plants are cultivated, though not artificially sown there. Such are the numerous weeds of our corn-fields, such as the red poppy, (*Papaver rhæas*, *P. dubium*, etc.), the blue bottle, (*Centaurea cyanus*), the charlock, (*Sinapis arvensis*), and many others.

Field, meadow, and pasture plants need but little enumeration. The situations which their name indicates are so familiar to every eye used to country scenery, that all must be acquainted with those most common in our native land, while those of foreign climes need but little notice at present. Grasses form the principal portion of these plants, and the speedwells, (*Veronica*), the field forget-me-not, (*Myosotis arvensis*), the white and red clovers, the buttercups, (*Ranunculus*), the field gentian, (*Gentiana campestris*), and many others, adorn our fields and pastures.

Wood, bush, and forest plants are also pretty well indicated by their name. There are many beautiful plants of this kind in our country, one of the most striking of which is the bush-vetch, (*Vicia sylvatica*), which is the most elegant climber of our woods and forests, though it is but rarely met with. *Linnæa borealis*, a creeping plant, of humble size and growth, with pretty little pinkish flowers, grows in our northern fir-woods, and is the plant selected to

commemorate by its name the illustrious Swede, the reformer of all previous systems of natural history, and especially of botany. Among other wood plants of our land may be mentioned the lily of the valley, (*Convallaria majalis*,) Solomon's seal, (*Convallaria multiflora*,) the wood-ferns, (*Lastræa multiflora*, and *L. filix mas*,) the herb Paris, (*Paris quadrifolia*,) the ophrys, (*Epipactis latifolia*,) the sweet-peas, (*Lathyrus sylvestris*, and *L. latifolius*,) the butterfly orchis, (*Habenaria chlorantha*,) and a multitude of other interesting plants. Of the trees which compose the woods and forests of our globe, and of the smaller forest plants of tropical countries, we shall have occasion to speak somewhat at length presently, and, therefore, may the better omit notice of them just now.

Heath plants are those which grow on the extensive commons called heaths. These, though well known and very extensive in some districts of our own land, are far surpassed in extent by those of Prussia, Poland, and Russia; as, for example, the vast heaths of Luneberg, which are said to cover a space of six thousand square miles. These immense tracts of land are covered with the common heath, (*Calluna vulgaris*,) which is often spread over very extensive surfaces, allowing no other plant to grow; though occasionally considerable quantities of furze, (*Ulex*,) broom, (*Cytisus scoparius*,) and brake, (*Pteris aquilina*,) are found amongst it. We have already alluded to the vast numbers of heaths

which clothe the plains of the Cape of Good Hope.

Parasites and Epiphytes. These are very singular plants in their appearance, their structure, and their habits and manner of growth. They obtain their nutriment, not from the soil, like other plants, but by fixing themselves upon trees or herbaceous plants, whose juices they absorb, and upon which they prey. We have but few of these plants native in our own country, but in foreign countries, in tropical climes, they swarm, especially in the dense forests of equinoctial countries. One of our British parasites, the broom-rape, (*Orobanche major*,) fixes itself upon the roots of the broom. Another species, (*Orobanche minor*,) may not unfrequently be found in clover-fields, growing upon the roots of the red clover.

A plant, which has of late years proved very obnoxious to farmers in several parts of the country, is a parasite called the clover-dodder, (*Cuscuta trifolii*.) It generally grows upon the red clover, though occasionally it will attack other plants. Its habit is singular. Its seeds, when ripe, drop into the earth, where, in process of time, they germinate, and send forth a little snake-like stem, which binds round the first suitable plant it meets with. As the stem lengthens, it puts forth from its sides little conical rootlets or suckers, which penetrate the bark of the plant around which it has twisted, and by these it extracts the sap from its supporter. After it has in this manner inserted

several of these suckers, the root dies, and the dodder thenceforth derives all its nourishment from the plant to which it has attached itself. As it still further lengthens, it puts forth at intervals globular heads of pinkish or yellowish flowers, which in due time perfect seeds, and being shed upon the earth repeat the same process. The plant on which it thus preys is commonly killed through the exhaustion of its juices by the parasite which lives on it, and whole fields of clover have been recently destroyed by the rapid growth and extension of this destructive plant.

A gigantic species is mentioned as growing in Affghanistan, which even preys upon itself; one of its masses half covered a willow tree, twenty or thirty feet high. The mistletoe (*Viscum album*) is another parasite, which is well-known in this country. Though now only associated with the festivities of Christmas, it was formerly employed by the Druids in their worship, and esteemed by them a sacred plant. It was gathered with many superstitious ceremonies, and used by them in those awful human sacrifices, which often stained the soil, while our country, unblessed by the light of the glorious gospel, was sunk in the grossest heathen idolatry, and but too plainly proved the truth of the Scripture declaration, that "the dark places of the earth are full of the habitations of cruelty."

A foreign plant, (*Loranthus*), very nearly allied to the mistletoe, is in warm countries a

beautiful object, its brilliant scarlet flowers forming a most striking contrast with the dark green leaves of the plant by which it is supported. But the most interesting and remarkable parasites, or rather epiphytes, with which we are acquainted, are the singular species of the *Orchis* tribe, which abound in the tropical forests of South America, and the south-east of Asia. "Seated on the branches of living trees, or resting among the decayed bark of fallen trunks, or running over mossy rocks, or hanging above the head of the admiring traveller, suspended from the gigantic arm of some monarch of the forest, they develop flowers of the gayest colours, and the most varied forms, and often fill the woods at night with their mild and delicate fragrance. For a long time such plants were thought incapable of being made to submit to the care of the gardener, and Europeans remained almost ignorant of the most curious tribe in the whole vegetable kingdom. But it has been discovered of late years, that by care and perseverance they may be brought to as much perfection in a hot-house as they acquire in their native woods, and they now form the pride of the best collections in England." The celebrated air-plants, so highly esteemed by the inhabitants of China and Japan, are epiphytes of this kind, natives of those countries, but which have the remarkable power of obtaining sufficient moisture from the atmosphere to maintain them in a luxuriant condition for weeks and even months, when

suspended by strings from the ceiling of a room. In this state they will grow for some time, blossoming freely, and their beauty and fragrance cause them to be regarded as favourite ornaments.

In having thus enumerated the principal kinds of soil and situation which plants inhabit, it is not to be supposed that every known species might be ranked under one or other of these, for there are many plants which will grow in several stations indifferently ; thus our common thrift, (*Armeria maritima*,) though generally found as a maritime plant, growing abundantly in marshes and pastures on the sea-coast, is sometimes found far away from the sea-air, at a considerable altitude on mountains, and it will also grow freely in the most inland gardens, as a cultivated plant. The majority of plants, however, prefer a particular situation, such as one of those we have indicated, having the conditions suitable to its growth, and will not succeed well in any other.

CHAPTER II.

Influence of climate—Light and heat—Chemical actions—Zones—Isothermal lines—Summer temperature—Equinoctial zone—Baobab—Age of trees—Bombax—Mahogany—Orchis—Climbers—Rafflesia—Tropical forests—Cacao-nut—Woorali poison—Cassava—Palms—Cocoa-nut—Sago palm—Arborescent grasses—Bamboo—Sugar-cane—Slavery—Scitamineæ—Gutta percha—Camphor—Spice Islands—Nutmeg—Clove—Cinnamon—Pepper—Nettles—Upas—Java—The forbidden fruit.

HAVING endeavoured to trace the influence of soil and situation on the growth of plants, we shall now consider the influence of climate upon them. We have already stated, that light and heat are two of the most important agents in influencing the vegetation of a country, and as these are more intense in proportion as we approach the equator, there vegetation is more luxuriant; and as all the conditions of their growth are thus most fully met, the greater number of species met with there will not surprise us. But it may be well to explain the way in which light and heat act upon plants. Plants are nourished by carbonic acid, which they derive partly from the soil and partly from the air, and though the latter contains this gas only in the proportion of one part in a thousand, yet this is sufficient to answer all the

purposes of vegetable life. A process, similar to that of respiration in animals, is continually going on in plants, but with a remarkable difference. Carbonic acid is being continually absorbed both by the roots and leaves of plants, especially during the day; while, under the influence of light and heat, this absorbed acid is decomposed by the vessels of the plant, the carbon being taken up and assimilated as nutriment, and the oxygen exhaled and returned to the air; but, during the night, carbonic acid is given off unaltered in its nature, light being absolutely necessary for its decomposition. This will explain and corroborate the common notion that plants in a sleeping-room are unhealthy at night, as the carbonic acid, which is given off, is injurious. It will easily be seen, also, that in the tropics, where there is a clear, unclouded sky, and where light and heat are most intense, oxygen will be thrown off during the day in the greatest abundance. This explains the greater luxuriance of vegetation in those regions, the stimulating influence of these agents causing a much larger amount of nutriment to be appropriated. On the contrary, in the higher latitudes, where light is feebler and the vegetation less vigorous, carbonic acid is given out in surplus quantity. The currents of the air, however, and the winds, restore the equilibrium, the oxygen of the tropics being carried towards the poles, and the carbonic acids of the colder climate in the direction of the equator, to feed the thick

and rank growth of the plants and trees of those latitudes. The influence of light is equally necessary to promote those peculiar combinations of the elementary constituents of plants which are termed their secretions, and which, in fact, render the vegetable creation of such vast importance to man. Starch, sugar, oils, gum, caoutchouc, acids, dyes, camphor, opium, the vegetable alkalies, and a great variety of other principles, are thus formed; and if the growing plant be deprived of any portion of the degree of light necessary for it, these secretions will not be formed, or only in diminished quantity.

A tropical plant of the composite order, nearly allied to our rag-worts and groundsels, (*Cacalia ficoides*,) illustrates this power of solar light. Its leaves combine with the oxygen of the atmosphere during the night, and are as sour as sorrel in the morning; as the sun rises, they gradually lose their oxygen, and become tasteless at noon; and by the continued action of light they lose more and more, till towards evening they become bitter. The amount of heat and cold which some plants will bear is very considerable. While plants are at rest in the winter they can bear a high degree of cold without injury. In those regions of Siberia where the cold is known to freeze quicksilver, (forty degrees below zero,) the vegetation in summer is much more luxuriant than that of the North Cape, where cold such as is felt in Siberia is quite unknown. This same amount

of cold (40°) is insufficient to destroy the vitality of seeds. It requires a heat of 122° .

In proceeding to consider more definitely the influence of various climates upon the vegetable world, we cannot do better than follow the system of baron Humboldt, than whom no man has more successfully studied this department of botanical science. He proposes to divide each hemisphere into eight zones, or bands, namely :—

1. The Equatorial Zone, from the Equator to 15° N. or S. lat.
2. The Tropical Zone, from 15° to the Tropics.
3. The Sub-tropical Zone, from the Tropics to 34° N. or S. lat.
4. The Warmer Temperate Zone, from 34° to 45° lat.
5. The Colder Temperate Zone, from 45° to 58° lat.
6. The Sub-arctic Zone, from 58° to the Arctic or Antarctic Circles.
7. The Arctic Zone, from the Arctic or Antarctic Circles to 72° lat.
8. The Polar Zone, from 72° lat. to the Pole.

In adopting these zones, as usefully exhibiting the influence of climate upon vegetation in general, it is necessary to bear in mind two or three particulars. One of these is, that it by no means follows, that because two places are situated on the same parallel of latitude, that their temperature and climate are therefore the same. Thus, though Quebec is in the latitude of Paris, the country is covered with deep snow four or five months in the year; and it has occurred, that a summer has passed there in which not more than sixty days have been free from frost. Rome, Pekin, and New York very nearly agree in their latitude, but differ widely both in their climates and productions. The

plants of Palestine, Florida, and the Carolinas also, differ widely from each other, though differing but little in latitude. *Isothermal lines* have, therefore, been constructed by naturalists, that is, imaginary lines passing through those places whose mean annual temperature is the same. Thus, an isothermal line may be drawn through Dublin, London, Manheim, in Germany, and Vienna, in each of which the average annual temperature is 50° . But it has been found by observation, that it by no means follows that the summer is equally hot, and the winter equally cold, at each of these places, for it appears that an isothermal line passing from west to east over the continent will, on an average, have a higher summer temperature and a lower winter one, as it proceeds eastward. This will be shown on the above line.

	Mean Annual Temperature.	Mean Summer Temperature.	Mean Winter Temperature.	Differ- ences.
Dublin . . .	50°	59°	41°	18°
London . . .	50	63	39	24
Manheim . .	50	67	37	34
Vienna . . .	50	69	32	37

Thus, Vienna, though far hotter in summer than Dublin, has a much colder winter. The amount of average summer temperature is, however, of more importance to the range of some plants than the mean annual temperature, inasmuch as they flourish and ripen their seeds before the cold of winter comes on. This is singularly exemplified at the Land's-end, in England. Here the summer temperature is so low, that the vine, apricot, and greengage will

not produce ripe fruit, and the winter is so mild that the myrtle, camellia, and other greenhouse plants, grow luxuriantly in the open air all the year round. In the northern hemisphere of the globe, all the eastern coasts of continents and islands are colder than the western coasts of the same latitudes. This is confirmed by repeated observations, though we cannot tell why. Ireland, England, and Belgium, have the same isothermal line, but on the eastern coast of Asia it passes just above Pekin, in China, which is 12° nearer the equator. Pekin has the same parallel of latitude with the south of Italy and Toledo, in Spain, where the orange flourishes, and many a tropical plant; but at Pekin, the winter's cold is far greater than in Great Britain, and falls short by only two or three degrees of that at North Cape. Canada is further south than Paris, yet it shows the temperature of Drontheim, in Norway. The trees which grow at New York, in the latitude of Naples, flower at the same time as they do at Upsal. Norway, exposed to the moist and temperate atmosphere of the ocean, enjoys a singularly mild winter, but receives very little of the sun's rays in summer. Lapland has a colder winter, but a warmer summer; and, accordingly, it is found that such plants as require only a few weeks of warm weather to bring them to perfection, succeed in Lapland, though they will not grow in Norway; while those which are easily killed by severe frost, flourish better in Norway than

in Lapland. These facts, which might easily be multiplied, sufficiently prove the statement made; but though we cannot doubt the fact, the cause is by no means so obvious. We must, however, leave this, and proceed to review the various zones, and their productions.

First, then, *The Equinoctial Zone* extends for 15° on each side of the equator, and has a mean annual temperature of 78° to 82° Fahr., a heat which, with a high degree of atmospherical moisture, calls forth an extraordinary profusion of vegetation, of the greatest variety of form and most brilliant colours. The principal countries embraced in these limits are Central Africa, including the Guinea Coast, and Abyssinia, etc., Ceylon, the southernmost part of Hindostan, Malaya, Cochin China, Sumatra, Borneo, Java, New Guinea, and the multitude of islands in that part of the eastern seas, the northernmost portion of Australia, and the northern part of South America, including Columbia, Peru, the Guianas, and part of Brazil. This zone is characterized by the gigantic forests so peculiar to the tropics. "The atmosphere of these forests, where vapour is continually ascending, is oppressively hot and damp. The shrill pipe of the large crickets, high up in the tops of the trees, and the loud croaking of the horrid vampyre, the flying-dog, and blood-sucker, often for days accompany the wanderer in the forests of India." Palms, bananas, orchises, arborescent grasses, and gigantic climbers, are among the

most characteristic plants seen in the zone. The immense size of some of the trees of this region excites universal astonishment. The *Baobab*, or monkey-bread, (*Adansonia digitata*), a native of Senegal, Cape de Verd Islands, Egypt, and Nubia, is one of the most gigantic trees known. The trunks of this species are found of the enormous size of from seventy to one hundred feet in circumference; the spread of the branches is extensive; main roots have been traced to the distance of one hundred feet from the main stem. The height of these enormous stems is not by any means in proportion to their size, frequently not much exceeding their diameter, this being often thirty-four feet, while the tree itself is rarely more than fifty or sixty feet high. It covers the sandy plains so entirely with its umbrella-shaped top, that a forest of these trees presents a compact surface, which at some distance seems to be a green field. Cape Verd has its name from the numbers that conceal the barren soil under their spreading tops. The hollow trunks of the baobab are often so capacious, that several negro families will take up their abode in one.

The gigantic size of these trees has often astonished the traveller, and has led to investigations with regard to their probable age. It is known to most observers, that the principal forest trees (in our own country, all) increase by coatings from without, and that the concentric rings visible on cutting across the stem afford an indication of the age, each ring being

the produce of a year ; the greater or less breadth of the rings also exhibiting the comparative favourableness of the season. If the number of rings in a transverse section are counted, and the girth ascertained by measurement, data are obtained, by which an approximation may be made to the age of any other tree of the same species still growing. The yew is the longest lived of any European tree. A yew, at Fountain Abbey, is considered to be 1,214 years old. One at Crowhurst, in Surrey, was 1,400 years old, when measured by Evelyn ; another at Fotherngill, in Scotland, was between 2,500, and 2,600 years old ; and another at Braburn, in Kent, 3,000 years of age. Oaks are considered to live 1,500 or 1,600 years. One in Welbecklane was computed by Evelyn to be 1,400 years old. Chesnut-trees are known to live 900 years ; lime-trees have attained 500 or 600 years in France. The alpine willow, which covers the ground with its leaves, although it is really a subterranean tree, is long lived. An ivy, near Montpellier, six feet in circumference, must be 485 years old. Eight olive-trees on the Mount of Olives are supposed to be 800 years old ; it is, at least, certain that they existed before the taking of Jerusalem by the Turks. The largest cedar on Mount Lebanon is nine feet in diameter, and is probably of the age of 800 or 900 years. Two cedars in the Botanic Garden at Chelsea were mentioned 600 years ago.

All these, however, are far distanced by the tree which has led to these remarks—the *Baobab* of Senegal, one of which was estimated to be 5,150 years old; yet baron Humboldt considers a cypress in the garden Chapullepec to be still older; it had already reached a great age when Montezuma was on the throne of Mexico, in 1520. But to return from this digression: the *Bombax*, or silk cotton tree, is another of these equinoctial trees of gigantic life. From the excessive abundance of the pith, its trunks increase prodigiously in thickness, and lose the common cylindrical shape, appearing like huge casks, thirty or forty feet high, and of proportionate circumference. It is often employed for making canoes, and a single trunk has been known to hold one hundred and fifty men. It derives its name from the silky character of the hairs, which surround the seeds just as the wool of the true cotton does. It cannot, however, be spun into threads, the peculiar smoothness of the hairs preventing them from binding together, while on the true cotton there are minute roughnesses on the filaments, which materially serve this purpose.

Among the other gigantic trees of the equinoctial zone, we may mention various species of the *Mimosa*, (often called *Acacia*,) the mahogany tree, (*Swietenia*,) the Brazil wood, (*Cæsalpinia*,) the locust tree, (*Hymenæa*,) bread fruit tree, (*Artocarpus*,) cashew nut, (*Anacardium*,) custard apple, (*Anona*,) etc. Martius represents a scene in Brazil, where some trees of the

locust kind occurred of such enormous dimensions, that fifteen Indians, with outstretched arms, could only just embrace them. At the bottom they were eighty-four feet in circumference, and sixty-feet where the boles became cylindrical. By counting the annual rings of growth in such parts as were accessible, he arrived at the conclusion that they were of the age of Homer. The mahogany tree inhabits this zone, and flourishes in most soils, but that which grows on dry rocky ground is most esteemed, as it has the richest colour, takes the highest polish, and is the hardest wood.

The trees are felled at two seasons—after Christmas and towards Midsummer. The logs are generally then conveyed to the rivers, where they are precipitated into the stream, down which they are floated to the “booms,” which are large cables stretched across the stream at particular spots. Sometimes the boom breaks with the pressure, and then more than a thousand logs are hurried out to sea, and irrecoverably lost. Some years ago, Messrs. Broadwood, the pianoforte manufacturers, gave the enormous sum of £3,000 for three logs of mahogany, each about fifteen feet long and thirty-eight inches square, and the produce of a single tree. The wood was especially beautiful, capable of receiving the highest polish, and when polished reflecting the light in the most varied manner, and from the wavy form of the pores, offering a different figure in whatever

direction it was viewed. 31,668 tons of mahogany were imported into this country in 1848.

But we must leave these gigantic denizens of the forest, and survey some of the other aspects of the vegetation of this zone. As in the woods of our own country the bark of the trees is covered with mosses and lichens, so the trees of these tropical forests exhibit a profusion of the most luxuriant and elegant forms; splendid parasites of the orchis tribe grow in the clefts and crevices of the bark, with flowers of the most brilliant hues, and the greatest variety of singular forms. The most elegant ferns, (*Polypodium*, *Hymenophyllum*, and *Trichomanes*,) climb up the trunks like ivy, or they grow in tufts, which fasten on the branches, and contrast in a peculiar manner with the foliage. In the forests of the Phillippine Islands, a large handsome polypodium often entirely covers a large part of the branch on which it grows with its thick, bright brown, sealy roots, and with its fronds, two or three feet long, of a bright yellow colour, contrasts most strikingly with the brown roots, and the dark green foliage around. If any little spot of the bark is left uncovered by these parasites, it is fastened on by lichens, mosses, and jungermanniæ; and some of the latter, of which it requires the microscope to reveal the exquisite beauty, grow upon the leaves of the other parasites—parasite upon parasite.

But not only are the forest trees covered with these splendid orchises, but a whole host

of climbing plants, taking root in the ground, at first twine up the trunks and branches, and afterwards, forsaking their parent soil, continue to grow up as parasites. The stems of some of these climbers have a singular inclination to throw off their bark whenever they are irritated by contact, and spread themselves upon the substance of the foreign body ; thus, the branches of the parasite by degrees coalesce, and the strength of the original root being weakened, the stem sends down air roots, and thus continually gains fresh strength and space. On the banks of the Rio Guama, Martius saw whole rows of a species of palm, so overgrown by one of these climbers, that the parasite had formed around the trunk (which was thirty feet high) a cylindrical tube, which bore leaves and flowers on short branches, and from the top of which rose the noble crown of the palm. In the forests of South America, some of these climbers form living ropes, or rattan cables, which produce neither leaves nor flowers for a length of thirty or forty feet ; and in the Asiatic forests similar ropes are formed by various species of passion-flower and rattan canes, (*Calamus*,) and these bind the trees together with such power, that the strongest hurricane cannot tear them asunder. So luxuriant and profuse is the vegetation of these regions, that even from the roots of the trees spring up a variety of plants, often of gigantic size and of singular form.

The *Rafflesia*, etc., of the Indian Archipelago,

are in appearance like large flowering mushrooms. *Rafflesia Arnoldi*, the most extraordinary species, has blossoms nine feet in circumference. The blossom is nearly all the plant, there being no leaves, and scarcely any stems or roots. Its buds are the size of an ordinary cabbage, and the flower, which is of a brick-red colour, smells of carrion. One, which was weighed and measured, was found to be ten and a half feet in circumference, fifteen pounds in weight, and the cup in its centre would contain a gallon and a half of liquid. The tropical parts of America and the South Sea Islands abound with various species of a different root-parasite, (*Balanophora*), of the most varied forms, and the richest colours. They greatly resemble fungi, with short, fleshy, branched stems, and the flower-stalks covered with tiled scales, and the flowers collected into dense heads.

In proportion to the rich beauty which a tropical forest displays, crowded with the various plants we have indicated, and with hundreds of similar species, is its fearful grandeur when agitated by a storm. "To be in such a forest during a violent hurricane is described as more fearful than to struggle with the raging waves in the open sea, and even far less violent storms produce sublime spectacles. When the boisterous wind catches hold of the tops of the gigantic trees of these natural forests, and shakes the branches and trunks against each other, the air is filled with a fearful rushing, thundering, rattling, and

crashing ; even the strong lianas are torn asunder, and the broken branches and stems fall to the ground. Great quantities of the parasites are thrown down from their lofty situations, and the trees are stripped of their fruit, which, generally cased in a hard shell, falls to the ground with a loud crash. The rain, at first warded off by the thick canopy of foliage, now falls in so much the greater masses, and adds to the horrors of the moment ; almost all the inhabitants of the forest betray their fear by mournful howling and crying ; the apes, the large bats, and the whole host of birds, call loudly all together ; and the croaking of the tree-frogs, and others of this family, sometimes like the sound of a drum, discloses the great misery of the moment. The insects only, which long before announced the coming uproar, are now silent, and keep close on the under surface of the leaves till all is over, and the sun again shines brightly out."

These vast forests abound in tropical America ; "the upper Orinoko flows for some hundreds of miles, chiefly through forests, and the banks of the Amazon are crowded with dense woods. In these the trees are colossal, and the vegetation so matted together by underwood, parasites, and climbers, that the sun's rays can scarce penetrate the dense foliage ; and so profusely are plants scattered here, that these forests vary very much in different places, though the climate and temperature are the same. Venezuela, Brazil, Guiana, Rio Negro, and Para, have

each a flora peculiarly their own ; nay, every river, and sometimes each tributary stream, has a different vegetation. No language can describe the glory of the forests of the Amazon and Brazil, the endless variety of forms, the contrasts of colour and size ; there even the largest trees bear brilliant blossoms ; scarlet, purple, blue, rose-colour, and golden yellow, are blended with every possible shade of green. An impenetrable and everlasting vegetation covers the ground ; decay and death are concealed by the luxuriance of life ; the trees are loaded with parasites when alive ; they become masses of living plants when they die."

Many parts of the coasts of Venezuela and Guiana are covered by woods of mangroves, avicennias, and the manchineel, with the unhealthy exhalations so peculiar to the places these trees select in such climates. The cocoa, or chocolate tree, (*Theobroma cacao*,) grows wild in Guiana, Mexico, and the east of the Caraccas ; it is now cultivated extensively, and as far south as Chili, and also in the Canary and Phillippine Islands. Whole forests of it occur in Demerara. It bears a fruit something like a short cucumber, full of seeds, which are the chocolate nuts. It is now very extensively used, and more than ever. 6,444,204 pounds were imported into this country in 1848, of which 2,935,479 pounds were entered for home consumption, and 1,604,813 pounds exported to other places. But the quantity consumed in England is trifling compared with that required

by other countries. A much larger quantity is consumed in France ; in Spain it is commonly drunk, in the shape of chocolate, for breakfast ; in Mexico it is considered an article of prime necessity.

In Guiana grows the *Strychnos toxicaria*, a creeping plant, from the fruit and bark of which the natives prepare the woorali poison, one of the most deadly known. Arrows dipped in the prepared juice are blown through tubes, formed from the internodes of a reed, (*Arundinaria Schomburgkii*,) and with a precision that rarely fails of its victim. Schomburgk thus speaks of its effects: "We were travelling over the Savannahs, girt by the Paracaima Mountains ; a deer was discovered browsing in the high grass before us. One of the Indians took a poisoned spike from his sarima, and fixed it to his arrow. Cautiously he stole upon the unsuspecting deer, and shot the arrow into its neck ; it made a jump in the air, fled with the speed of the wind over the Savannahs, but had scarcely run forty yards when it fell panting to the ground, and expired. I have seen the tapir swimming across the Rupumuni, so slightly wounded that the spike had scarce penetrated its thick skin ; nevertheless, it took effect, and the animal expired." The blow-pipes above alluded to are the produce of a singular reed, allied to the bamboos, and hollow inside ; they are called *curata* by the natives. The stem is about one and a half inches in diameter, or five inches in circumference, and

risers from the root-stock to a height (often) of sixteen feet without a joint, and of equal thickness throughout. The first joint then occurs, and the first branchlets are formed. A joint then appears at every fifteen or eighteen inches, to a further height of forty to fifty feet. The whole stem is from fifty to sixty feet high, but the weight of the numerous branchlets forces the slender stem to droop, and the upper part describes an arch, which adds greatly to its graceful appearance.

Two kinds of mandioc, or cassava, grow in Spanish America and Brazil, which bear tuberous roots, the farina of which is used as food by the natives; the root of one is harmless, but the other contains a poisonous milky juice, the effects of which are removed by cultivation or pressure. Its limit of growth extends to about 30° on each side of the equator, and an acre of it is said to yield as much nutriment as six acres of wheat. The humiria (a native of South America) has so powerful a perfume, that it has been inhaled at the distance of three miles out at sea.

We have already mentioned palms as among the characteristic plants of this zone. There are no less than four hundred known species of this remarkable and beautiful tribe, eighty-one of which inhabit tropical Brazil alone; some with hardly any stem, others towering to the height of one hundred and thirty feet. So narrow here are their geographical limits, that Humboldt and Bonpland discovered a new species in every fifty miles of travelling. The

palm has ever been the queen of the woods, not only on account of the beauty of its form, but because of its extraordinary usefulness. Though the species of palm are so numerous, there are few, perhaps none, which are not in some way useful to man. No other tribe produces such enormous quantities of fruit. *Alfonsia amygdalina*, a South American species, has 207,000 flowers in a single flower-sheath, or 600,000 upon an individual, though all do not ripen. The seje palm of the Oronoko bears 8,000 fruits on every branch. The whole tribe is one of the most interesting in the vegetable kingdom; their towering stems, their majestic foliage, their immense value as affording food, raiment, and a variety of products of economical and commercial importance, the character of grandeur they impress upon the landscape, and the great variety of their appearance and habits—all combine to attract attention to them. We shall glance briefly at a few of those which inhabit this zone.

The cocoa palm is, perhaps, the most important of all. Its native country is the old world and the South Sea Islands; it has, probably, migrated to America, and grows there in great numbers on the West India Islands and Brazil. In the Southern Ocean it often points out to the mariner the rocks of coral on which it grows, and which are so dangerous to navigators. On the damp coasts of India and the rich Island of Ceylon, the cocoa palms grow in millions, and not only minister to the wants

of the inhabitants, but form a profitable article of trade. In the south of Ceylon there is a forest of the cocoa palms, which stretches along the sea-shore for twenty-six miles, is several leagues in breadth, and is estimated to contain eleven millions of full-grown trees. When the Dutch were masters of Ceylon, six thousand casks of arrack, three millions of pounds of coir rope, (a cordage made from cocoa fibres,) and an immense quantity of oil, were annually obtained from this forest. Like all other fruit-trees, it is improved by cultivation. It grows rapidly, and at six years old often bears thirty nuts. When full grown it will produce two hundred to three hundred nuts, and will live to the age of one hundred years. The fresh ripe nut is full of a fluid as clear as water, and of a sweetish taste, which is an extremely cooling and agreeable drink, often enthusiastically praised by travellers. The kernel, boiled in sugar, forms a delicious sweetmeat, and is universally eaten in the Spanish colonies in tropical countries. The cocoa nut oil is obtained by long boiling the kernel in water, and then pressing it; it is largely used in our manufactories. It is surprising that it is not more generally used as a domestic article, as, instead of the very unpleasant smell of fish oil, it has rather an agreeable odour, and is readily consumed in open glass vessels, with floating or standing wicks, whatever the temperature of the air may be. The nut-shells are used by the natives for drinking-cups, and being very

hard, and susceptible of a high polish, are also formed into numerous ornamental articles. The fibrous husk is made into cordage, ropes, (coir rope,) mats, brushes, and similar articles. The leaves are used for thatching; and the stems, though they cannot be cut into planks, are used entire, as pillars in the support of large buildings. From the sap an excellent wine is produced, which, however, will keep but a very short time ere it becomes converted into vinegar.

Another valuable species is the sago palm, or rather number of species, for several are known which yield this important article of commerce. The principal ones are, *Sagus lævis*, *S. genuina*, *S. Rumphii*, *Cycas circinalis*, *Cycas revoluta*, *Caryota urens*, *Phœnix farinifera*, and *Saguerus saccharifer*. They grow extensively in the East Indies, Siam, China, Japan, Java, Sumatra, Borneo, Malacca, etc. Sago is prepared from the pith of the trunk, which must be cut down for the purpose. The pith is only fit for making sago immediately before the flowering of the tree; at a later stage, either none is obtained, or only a bad woody kind. The pith being extracted, is rubbed down in water into small particles, which will pass through a sieve. A single trunk of *Sagus Rumphii*, fifteen years old, will yield 600 pounds of sago; and an acre of land, planted with these palms, yields an annual produce of 8,000 pounds.

Saguerus saccharifer, one of the sago palms, is a very important species. It is very common in

the Asiatic Archipelago, the Moluccas, and the Phillippine Islands. Its juice is obtained in large quantities, by wounding the flowering spathe : it yields by evaporation a kind of sugar, and by fermentation an intoxicating drink. When the trees are exhausted of sap, from 150 to 200 pounds of good sago may be obtained from the trunk. The timber is extremely hard, and useful for building purposes ; and from four to seven pounds of strong horse-hair like fibres, may be annually obtained from the leaf-stalks : these are extensively used in making cordage, ropes, and cables. Its fruit is very acid, exciting severe inflammation in the mouth of those who chew it ; it was the basis of the " infernal water" which the Moluccas used in their wars to pour over their enemies. Another palm (*Borassus flabelliformis*) grows in extensive groves in the valley of the Irrawaddy ; it is a magnificent tree, often one hundred feet high, remarkable for its gigantic leaves, one of which would shelter twelve men.

The celebrated betel nut is the fruit of a palm, (*Areca catechu*,) and is chewed by the Indians with the leaf of a species of pepper, which together produce powerful narcotic and intoxicating effects. We are told that the Asiatic nations would rather forego meat and drink than their favourite betel nuts, whole ship-loads of which are annually exported from Sumatra, Malacca, Siam, and Cochin China. Vegetable ivory and palm oil are the products of palms. The former is the fruit of *Phytelephas*.

macrocarpa, called by the natives "Negrohead." It is found in the groves of Peru, in the hotter part of the Andes. The latter (palm oil) is obtained by expression from the fruit of *Elais guineensis*, a native of the western coast of Africa. Enormous quantities of this oil are employed in Europe as a sort of grease, and in the manufacture of soap and candles. It is of a deep orange colour, but is often bleached for use in the arts. 510,129 cwt. were imported into this country in 1848.

A very remarkable feature in this zone is that which we have already alluded to under the name of arboreseent grasses, and of which one of the most remarkable is the bamboo, (*Bambusa*), which often forms woods as extensive as the pine and fir forests of the northern regions. These gigantic grasses have a stem often fifty or sixty, or even a hundred feet high, sending out lateral branches. Their form is remarkably elegant; their slender trunks, with bending branches, and long grassy leaves, are very singular; they somewhat remind the European traveller of the willows of his native country. They are planted in tropical countries to adorn the landscape, as the willow is with us; and a beautiful lawn, surrounded by bamboos, as may be seen in India, is a most charming object. To the Indian savage, bamboos afford almost all he wants, excepting food. "With their lightest shoots he makes his arrows, the fibres of the wood form bow-strings, and from the larger stems he fabricates a bow; a long and slender

shoot affords him a lance-shaft, and he finds its hardened point a natural head for the weapon. With the hardened stems he builds the walls and roof of his hut, its leaves afford him an impenetrable thatch, split into narrow slips it gives him the material for weaving his nets, and other articles of domestic convenience, and its fibre furnishes him with twine. Would he commit himself to the waves, the stems form the hull of his boat, which, by a few skins stretched over it, is rendered water-tight; they also give him masts, and these slips of wood become cordage, and are woven into sails."

In Japan, China, and India, the stems of the bamboo are applied to a great variety of useful purposes. Water pipes are made of them; they are used in constructing fences, houses, and boats, and a variety of articles of furniture. Some of the gigantic reeds of Brazil, called *Taquarussa*, are living fountains; they grow from thirty to forty feet high, and eighteen inches in circumference, forming thorny impenetrable thickets; to hunters and travellers they are exceedingly grateful, for, on cutting off such a reed just below the joint, the stem of the younger shoots is found to be full of a cool liquid, which quenches the most burning thirst.

Another gigantic grass, which has been more closely identified with the interests of the human race than any other of the tribe, is the sugar-cane. It is a native of the old world, which was cultivated in China and the South

Sea Islands before the historical era, and Columbus found it wild in many parts of America. The sugar-cane succeeds best with a mean temperature of 75° or 77° , but can be cultivated in colder parts, where it amounts to 66° or 68° . The limit of sugar culture stretches therefore from the equator to some distance beyond the tropics; it is even found cultivated in Sicily and Spain. On the mountains of Mexico and Columbia, it is grown even to the height of 6,000 feet; and sugar plantations were formed by Cortes on the table-land of the town of Mexico, at 6,600 feet above the level of the sea.

On the Himalayan mountains, also, sugar and cotton are grown on the table-lands at the height of 4,500 feet. Sugar is chiefly cultivated as an article of commerce in the West Indies, Brazil, and India. The sugar-cane is raised from shoots two or three feet in length, which are prepared from the shaft of the full-grown plant. In fourteen days, the shoots spring from the joints, and in the space of a year the shaft, or main stem, is so far grown that it may be cut down. On land freshly taken in which is well planted, and not exposed to long inundations, the sugar-cane yields from twenty to thirty annual crops, since new shoots spring every year from the perennial root. Humboldt saw a sugar plantation in Cuba which had been in existence forty-five years. The native sugar-cane of Tahiti has been planted in the West Indies, and is found to be far richer than

the old variety ; it yields a quarter more juice, and a larger and more solid mass of wood for fuel. It seems, however, that the East Indian sugar-cane is still more productive than that from Tahiti ; for, in Bengal, the produce is twice as great as in Havannah, while the wages of the Indian are only one-third the cost of maintaining a slave.

The process for making raw sugar is briefly as follows :—The leaves having been stripped off by machinery, the stems are passed between powerful rollers, which crush them so as to express the juice, which, being collected as it flows, is then evaporated by successive boilings, the crushed canes being used as fuel ; it is then clarified, and finally crystallized. From this the uncrystallizable sugar, called molasses, or treacle, is then drained, and the remainder, namely, raw sugar, being packed in hogsheads, is ready for exportation. Very large quantities of spirits (rum) are also distilled from the crushed canes, and from the molasses. The quantity of raw sugar imported into this country, in 1848, was 6,871,468 ewts. ; but a considerable quantity, after having been refined and made into lump sugar, is exported. The quantity of molasses, or treacle, imported during the same period, was 517,721 ewts. ; and of rum, 6,859,340 gallons.

We cannot, however, think of sugar and its cultivation, without remembering its intimate connexion with negro slavery and the slave-trade ; a system of which we cannot speak

in terms of too great indignation; a sin in which our beloved country has happily at length ceased to participate, though the guilt of it lay at her door many years; and still America—enlightened America—persists in committing, and holds in common with Spain and many other nations. How many barbarous cruelties—how much gross oppression—how many cold-blooded murders—how much covetousness, licentiousness, and every kind of iniquity, have been the fruit of this accursed system, He alone knows who knows all things. Truly were

“Slavery’s island altars built
And fed with human victims; while the cries
Of blood, demanding vengeance from the skies,
Assail’d the trader’s grovelling heart in vain—
Hearts dead to sympathy, alive to gain,
Hard from immunity, with avarice cold,
Sordid as earth, insensible as gold.”

“We rejoice that our country has purged herself from the crime, and long to see the day when, in every land, slavery and oppression shall for ever cease. The gospel alone, however, by the power of the Holy Spirit, can produce this change, and the best way to promote it is to seek, by effort and prayer, the universal diffusion of the religion of Christ, which, by renewing the heart through faith in him, brings “glory to God in the highest, and on earth peace, good-will toward men.”

A striking feature among the plants of this zone is the ginger tribe, *Scitamineæ*, the rich and glowing colours of their flowers and floral leaves rendering them objects of great beauty.

Ginger and turmeric are the chief economical products of the tribe; the latter is used in dyeing, affording a beautiful yellow. It is the root-stock, or rhizome, of *Curcuma longa*, a native of eastern Asia. Ginger is the same part of the plant of *Zingiber officinale*, a native of the south-east of Asia and the adjoining islands, but early transplanted to America and the West Indies, where it has been cultivated with great success. Most of what is now used is imported from Jamaica, Bengal, the Malabar coast, and Africa; the first is, however, the best. Galangale, zedoary, and cardamoms, are also the produce of plants of this order.

In the Archipelago of Asia, which lies almost entirely in this zone, jungle and pestilential woods entirely cover the smaller islands, and the plains of the larger; the coasts are lined by forests of mangroves, bamboos, and trees overgrown by myriads of orchideaceous parasites; here, too, abounds the tree yielding gutta percha, (*Isonandra gutta*), which has recently become an important article in commerce, being capable of application to so many purposes of utility and elegance. The forest trees of these islands are almost unknown; the greater part are quite peculiar to them. The naturalist, Rumphius, had a cabinet inlaid with four hundred kinds of wood, the produce of Amboyna and the Molucca Islands. Sumatra, Java, and the adjacent islands, produce a tree, (*Dryobalanops camphora*), in whose stems solid lumps of a remarkable kind of

camphor are found, which is greatly valued in China, and fetches a very high price. The camphor of commerce is principally obtained from *Camphora officinarum*, a tree of the laurel tribe, a native of China, Japan, and Cochin China. The camphor is obtained from the wood, branches, and leaves, which are boiled in water, and the camphor sublimes. As imported, it is in small grains, dirty and greyish in colour; it is purified in this country by sublimation. In some species of cinnamon, camphor is contained in such abundance, especially in the roots, that they are unfit for use as a spice.

Most of the spices are limited in their distribution. Thus the *Myristica moschata*, which produces nutmegs and mace, is confined to the Banda Islands, but is said to have been lately discovered in New Guinea. The Dutch, who were masters of these islands at an early period, endeavoured to secure the exclusive trade and growth of these valuable spices, and so to regulate the quantity produced as to keep up high prices. Sometimes they cut down trees, and at other times destroyed immense quantities of the spice, if the crop was too plentiful. They more than once, however, suffered dearly for their avarice, the nutmeg trees of Banda having been nearly destroyed by hurricanes and earthquakes, which spared other islands. The quantities imported into this country, in 1848, were, of mace, 47,572 pounds, and of nutmegs, 336,420 pounds.

The clove tree, (*Caryophyllus aromaticus*), a plant of the myrtle tribe, inhabits the Amboyna and Molucca groups, but has been introduced into many parts of Asia, many of the West India Islands, Cayenne, Mauritius, and Bourbon. The Dutch, who possessed the Spice Islands, pursued the same absurd and covetous practice with the clove trees, which we have already noticed with regard to the nutmegs ; and the practice, more than once, occasioned an insurrection among the natives, who regard the clove trees with great attachment, and are in the habit of planting one at the birth of each child. Every part of the clove tree is covered with minute dots, or glands, which secrete and contain an aromatic oil ; and so abundant is it in the flower-buds, (which when dried are the cloves of commerce,) that it may be expressed from them. It is one of the few essential oils that are heavier than water. The annual produce is from two to two and a-half pounds from each tree ; but a fine tree has been known to yield 125 pounds ; and as 5,000 cloves weigh one pound, there must have been, at least, 625,000 flowers on this single tree. The quantity imported in 1848 was 105,295 pounds.

Cinnamon and pepper also grow in these same islands. The former is the bark of *Cinnamomum zeylanicum*, and the best is the produce of the young branches, from one to two inches in diameter. The cinnamon imported into England is chiefly brought from Ceylon, and is grown principally in the neigh-

bourhood of Columbo. The quantity imported in 1848 was 357,463 pounds. An inferior kind of cinnamon, called cassia, or *Cassia lignea*, is the bark of *Cinnamomum aromaticum*, and is imported principally from Singapore. The principal city of the province Kwangse, in China, is named Kweihin, or Cassia Forest, from the forests of cassia around it. 510,247 pounds were imported in 1848. So powerful is the perfume of the cinnamon plants, that it is wafted far out to sea. This is alluded to by bishop Heber, in his beautiful hymn :

“ What though the spicy breezes
Blow soft o’er Ceylon’s isle,
Where every prospect pleases,
And only man is vile ;
In vain with lavish kindness
The gifts of God are strewn,
The heathen in his blindness
Bows down to wood and stone.”

Cinnamon was among the spices known to the Jews, and was doubtless imported into Palestine by the Arabians, who were the chief merchants to India in ancient times, and were the medium through which the spices, and other productions of India, were carried into western Asia, Egypt, Greece, and Rome. Cinnamon was in use in very early times. It was among the spices which were appointed for perfuming “the holy anointing oil,” with which the tabernacle, the sacred vessels, and the priests were to be anointed, (Exod. xxx. 23—31.) It is placed among other fragrant plants in Solomon’s Song iv. 14. Cassia is also mentioned in the former passage, and

again in Ezek. xxvii. 19, as one of the articles which were prominent in the markets of Tyre.

Pepper is another important production of the Spice Islands ; though it has been introduced there, and is a native of the East Indies and Malabar. It can be cultivated in tropical countries only, and even there its limits are very narrow, extending but to a few degrees on either side of the equator. Its cultivation is thus managed :—Ground, covered by wood, is chosen, and cleared by felling, burning, etc., and then divided into beds, each six feet square, in each of which is fixed a support, on which the plant may climb. This is either a pole, or a slender living tree ; the latter is preferred when it can be had. The pepper is planted by slips, two plants being set by each pole ; in three years, they gain the height of from eight to twelve feet, and begin to bear fruit. About this time, when the pepper has become ripe, the whole plant is cut down to the length of three feet, carefully separated from the support, and laid horizontally in a circle on the ground, so that the ends again take root. The plant now shoots out afresh, and bears every year a large quantity of fruit ; without this treatment it would chiefly have thrown out leaves. The berries are at first green, but, when ripe, are a beautiful red. Whenever a part of the berries are ripe, the whole are taken off, and spread on mats or on the ground, where they become dry, of a black colour and

wrinkled surface, forming black pepper. White pepper is prepared from the perfectly ripe berries, by soaking them in water to deprive them of their skins, which are carefully separated, and the pepper is then sun-dried. The berries require four or five months to ripen.

Full-grown pepper plants yield two crops in the year; and the produce of one thousand plants is considered to be equal to four hundred or four hundred and fifty pounds of pepper. In Java, the crop is so great sometimes, that the leaves of the plant cannot be seen for the immense quantity of berries. A much larger quantity of pepper is consumed in hot countries than in Europe, the inhabitants of warm climates being very fond of highly seasoned dishes. The quantity imported into England, in 1848, was 8,125,158 pounds, of which 3,189,313 pounds were retained for home consumption, 4,385,030 pounds being again shipped for the continent, etc. The produce of the pepper countries is thus stated by Mr. Crawford :—

Sumatra	28,000,000 pounds.
Islands in the Straits of Malacca	3,600,000 "
Malay peninsula	3,733,333 "
Borneo	2,666,667 "
Siam	8,000,000 "
Malabar	4,000,000 "
<hr/>	
Total annual produce	50,000,000 pounds.

In the Asiatic Archipelago, also, the nettle tribe assumes its most pernicious character. One species of nettle, (*Urtica stimulans*), a native of Java, has so virulent a sting, that it

occasions not only pain, but illness, which lasts for days. Another species, (*Urtica urentissima*), growing in the island of Timor, and called by the natives "Devil's leaf," is so poisonous, that its sting produces long illness, its effects lasting for a whole year, and sometimes even death is the result. Leschenault de la Tour thus describes the effect of gathering *Urtica crenulata*, at Calcutta: "One of the leaves slightly touched the first three fingers of my left hand; at the time I only perceived a slight pricking, to which I paid no attention. The pain continued to increase; in an hour it had become intolerable; it seemed as if some one were rubbing my fingers with a hot iron. Nevertheless no inflammatory pustule, or swelling, was to be seen. The pain spread rapidly along the arm, as far as the arm-pit. I was then seized with frequent sneezing, and a copious running from the nose, as if I had caught a violent cold. About noon I experienced a painful contraction at the back of the jaws, which made me fear an attack of *tetanus*. I then went to bed, hoping that repose would alleviate my suffering, but it did not abate; on the contrary, it continued nearly the whole of the following night, but I lost the contraction of the jaws about seven in the evening. The next morning the pain began to leave me, and I fell asleep. I continued to suffer for two days, and the pain returned in full force when I put my hand into water. I did not finally lose it for nine days." A similar circumstance

occurred, with precisely the same symptoms, to a workman in the Calcutta Botanic Garden. This man described the sensation, when water was applied to the stung part, to be as if boiling water had been poured over him.

The celebrated upas also inhabits the woods and forests of this portion of our globe. It was formerly supposed that no one could approach it without the most imminent danger of death, from its poisonous exhalations. This is now, however, to be classed among popular errors; still, the juice is a most virulent poison, one of the most deadly known; and it is even possible that at certain seasons, and especially during the night, its exhalations may be of a noxious character, like those of the West Indian manchineel tree, which is known to be highly injurious, and is said to have been even fatal to those who venture to sleep beneath its shade. The poisonous character of the upas is said to be owing to the presence of that most deadly substance, strychnia. Linen made from its tough fibres, if insufficiently prepared, is so acrid as to excite the most distressing itching.

It is a singular fact, that this virulent plant is very nearly allied, in its botanical character, to the useful and delicious bread fruit. Java also contains another plant, (*Strychnos tieuté*), from the bark of the root of which a frightful poison is prepared by the natives, who call it *tjettek* and *upas radja*; it is exceedingly virulent, and probably owes its deadly nature to strychnia. All the species of *strychnos* appear

to be very poisonous, except one, *S. potatorum*, the fruit of which is called the "clearing nut," and is sold in every market in India to clear muddy water. The natives never drink clear well water if they can get pond or river water, which is always more or less impure, according to circumstances. One of the seeds is well rubbed round the inside of the vessel, generally an unglazed earthen one, containing the water, which is then left to settle; in a very short time the impurities fall to the bottom, leaving the water clear. One of the upas genus (*Antiaris*) is used for making sacks in India, by the following singular process: "A branch is cut, corresponding to the length and diameter of the sack wanted. It is soaked a little, and then beaten with clubs till the fibre separates from the wood. This done, the sack formed of the bark is turned inside out, and pulled down till the wood is sawn off, with the exception of a small piece left to form the bottom of the sack. These sacks are in general use."

"No country is richer than Java in club mosses (*Lycopodium*) and orchideous plants, which overrun the trees in thousands in the deep, dark, mountain forests, choked by huge creeping plants, with an undergrowth of gigantic grasses, through which not a ray of light penetrates. Sir Stamford Raffles describes the vegetation of Java as 'fearful.' In these forests, the air is heavily charged with damp and deadly vapours, never agitated by a breath of wind; the soil, of the deepest black vegetable mould,

always black and clammy, stimulated by the fervid heat of a tropical sun, produces trees whose stems are of a spongy texture, from their rapid growth, loaded with parasites, especially the orchideous tribe, of which no less than three hundred species are peculiar to the island." Of *locopodia* more than two hundred species are found, and the tree ferns form a twentieth part of the whole vegetation. Fruit and vegetables proper for food abound, perhaps more than in any other part of the world, and no less than one hundred varieties of rice grow here.

Ceylon is, as we have just mentioned, the country of cinnamon, and there also grows a remarkable tree, *Tabernæmontana dichotoma*, pretended by the sages of that country to be the forbidden fruit, and they also assert that paradise was situated in that island. They say that it may be identified by the fragrance of its flower, and by its beautiful tempting fruit, still bearing the marks of the teeth of Eve. Till the sin was committed they pretend the fruit was delicious, but from that time forward it became poisonous, as it now remains.

Of the flora of that part of Africa which lies in this zone very little is known. One more feature in the equinoctial zone must be noticed ere we leave it. When the atmosphere and soil are destitute of its proper degree of humidity, there is a striking change in the relations of the seasons. In the height of summer, the trees lose their leaves, and the herbs die, so that the

appearance of the vegetable world is the same as in winter with us. With us the cause is want of heat—in these regions the cause is from want of moisture. Some of the American plains, during the dry seasons, are as desert as the Lybian wastes, but during the wet season they are covered with luxuriant grasses and the smaller acacias.

CHAPTER III.

The tropical zone—Tree ferns—Ipomœa—Passion flower—Victoria—Potato—Arrow-root—Dumb-cane—Manchineel—Hura—Sandwich Islands—Pandanus—Pine apple—Banana—Taro—China—The sub-tropical zone—Succulent plants—Euphorbias—Fig tribe—India-rubber—Banian—Dracœna—Desert—Papyrus—Egypt—Gourd tribe—Acacia—Balm of Gilead—Tamarisk—Henna—Coffee—The Land of Promise—Date palm—Lily—Cedar—Olive—Pomegranate—Carob—Myrtle—India—Teak tree—Castor oil—Lemon grass—Spikenard—Cotton—Himalayas—China—Tea—Rice—Australia—Acacias—Eucalyptus—Epacris—Grass tree—South Africa—Proteas—Heaths—Geraniums—Mimosa—Aloe—Cycas—House-leek tribe—Deserts—North America—Tobacco—Mexico—Agave—Furcrœa—South America—Cactus.

THE *Tropical Zone* extends from 15° N. or S. lat. to the tropics respectively, and has an average temperature of from 73° to 80° Fahr. The principal countries embraced by this zone are, parts of Bolivia, Brazil, and Paraguay, in South America; the majority of the West India Islands, Yucatan, Guatemala, and part of Mexico; Nubia and Senegambia, in Africa; Madagascar, Mauritius, and North Australia; parts of China and India, Burmah, and the south of Arabia. A considerable part of the countries within this zone lies under such conditions, that, from want of sufficient moisture, and from having too poor a soil, they are des-

titute of almost all the beauties of tropical vegetation. Many of the features we have described under the last zone are common to this also, especially where the moisture, etc., is such as to admit of the development of vegetation to the extent the climate will allow. In some portions of the zone, especially the southern, palms, bananas, mangroves, orchideaceous parasites, and rope-like climbers, also are found. Tree ferns, and plants allied to the convolvulus and pepper tribe, are some of its most striking features.

The tree ferns frequently have a stem forty or forty-five feet high, and bearing at the top a beautiful crown of those peculiarly graceful leaves for which the ferns are so remarkable. Some species have trunks no thicker than three inches in diameter, but twenty to twenty-eight feet high, with a crown of fronds, each eight or nine feet long, of the most elegant and feathery form, and from their extraordinary delicacy put into tremulous motion by the gentlest wind. It will thus be seen that they bear a considerable external resemblance to the palms; and, in fact, so close is the similarity of the stems, that a number of fossil trunks, which have been discovered in the quarries of our more northerly regions, and which were considered as palms, have been proved by later investigations to belong almost exclusively to tree ferns and cycadæ.

The tree ferns chiefly prefer moist, and especially island situations. On some of the East

India Islands they grow in such numbers, that their stems are as close to one another as the slender firs and pines in our plantations. In Australia and New Zealand they abound. In that part of this zone which lies in South America several interesting plants claim our attention. One of the most beautiful is the genus *Ipomæa*, a vast number of species of which abound, especially in the woods, and with their large and beautiful flowers, like those of the convolvulus, of every variety of crimson, scarlet, purple, violet, and other rich colours, and their twining stems, forming rich festoons from the trees and bushes, exhibit a most gorgeous picture to the eye of the traveller. One of the species yields the drug jalap; another (*Ipomæa tuberosa*) is in Jamaica an evergreen plant, and as it will grow to an enormous length, (three hundred feet,) and is profusely clothed with leaves and handsome yellow fragrant flowers, it is often trained over lattice-work and arbours, giving a delightful shade and a refreshing perfume.

The passion flower is another plant of which numerous species inhabit South America and the West Indies. In this, their native soil, they are far larger than in our country, and very fragrant, and climbing to the top of the highest trees, (some of which are one hundred and fifty feet high,) they twine about the branches, and clasp them with their tendrils, while their blossoms, of every shade of blue, red, white, or purple, hang in profusion from them. The name of passion

flower was given it by the Spaniards, who found it in all its beauty when they discovered America, and fancied they beheld in the flower the nails, the hammer, the rays of glory, the number of the apostles—an emblem, in fact, of our Saviour's crucifixion, and an assurance of conquest, as they imagined, in the name of religion. But how remote their conduct was from the spirit of Him in whom they professed to believe, and whom they professed to follow, let the history of the conquest of South America tell! More anxious to subjugate the Indians, to acquire their riches, and to force upon them the principles of Popery, than to manifest the spirit of Christ, "the very men who beheld in a flower of the forest an emblem of His love—an emblem for faith to rest upon—carried misery wherever they raised their standard." Seventy-six species of passion flower inhabit tropical South America, and about thirty species are found in the West Indies.

Another beautiful flower, allied to the water lily of our country, but of far more splendid form and gigantic dimensions, (*Victoria regina*,) inhabits the waters of South America. Its leaf is from five to six feet in diameter, and about sixteen feet in circumference, salver-shaped, and with a rim from three to five inches high rising from its edge, green within and crimson outside. The flower is of a proportionate size, the expanded calyx being often nearly six feet in circumference; this contains several hundred petals, the outer ones being white, and the

inner pink, with every intermediate shade in those between, and exhaling a delicious perfume.

The potato appears to have its indigenous country in the Cordilleras of South America, and possibly in Virginia also ; but it has been now so generally cultivated in both places for so many centuries, that it is very difficult now to speak with certainty as to its native habitat. It still seems indigenous in Chili and Peru, where it is a native of the sea-strand, and is never found *naturally* more than four hundred feet above its level. In its wild state the root is small and bitter, and the stem becomes woody and bristly from age. This is one of the many instances in which cultivation has rendered some of the most unpromising plants useful to man. It appears that it was introduced into Europe by the Spaniards from Quito, early in the sixteenth century ; but not into our own country till 1586, when it was brought from Virginia by sir Walter Raleigh. It was not, however, till more than one hundred years after its first introduction that it came into anything like general cultivation, and nearly one hundred years more elapsed before much attention was paid to its varieties, or a large extent of ground employed in its cultivation. A great degree of reluctance seems to have been felt by the common people to cultivate this useful vegetable. Frederick the Great even compelled the Pomeranians to accept the benefit. It does not succeed in cultivation in the plains of the

torrid zone, though it will grow on the Andes at from 9,800 to 13,000 feet above the level of the sea, nor will it grow further north than Iceland.

In the West Indies, the arrow-root plant (*Maranta arundinacea*) is cultivated to a great extent, but it is a native of equinoctial South America. The best is brought from the Bermudas, in the sub-tropical zone, 32° N. lat., but large quantities are also imported from St. Vincent's. The South Sea arrow-root, which the late rev. J. Williams first introduced into this country, is the produce of a tuberous-rooted plant of quite a different character, (*Tacca pinnatifida*.) The arrow-root, as used in England, is the farina or starch obtained from the root, by washing the rasped or pounded tubers in water. It is said to owe its name to the belief of its being an antidote to the poison of the arrows of the Indians. Sugar, which is the principal produce of the West India Islands, we have described under the equinoctial zone. Pimento, or allspice, is the only spice which occurs naturally in the West Indies, and it is remarkable, that though not a single plant has been raised by sowing the seed, yet self-sown it multiplies exceedingly.

In these islands also is found the dumb-cane, (*Dieffenbachia seguina*,) one of the arum tribe. It grows to the height of a man, and has the property, when chewed, of causing the tongue to swell, and thus destroying the power of speech. Hooker relates an account of a gardener, who incautiously bit a piece of the dumb-cane, when

his tongue swelled to such a degree that he could not move it ; he became utterly incapable of speaking, and was confined to the house for some days in the most excruciating torments. Another extremely venomous West Indian plant is *Isotoma longiflora*, a lobeliaceous plant ; the Spanish Americans call it *Prebenta caballos*, because it proves fatal to horses that eat it, causing them to swell until they burst ; taken internally it acts as a violent cathartic, the effects of which no remedy can assuage, and which end in death ; the leaves make a powerful blister.

The manchineel tree (*Hippomane mancinella*) is a native of these islands, and has been already alluded to. It is extremely poisonous, and the juice when applied to the skin produces corroding ulcers. It has been stated on good authority, that if a person takes refuge under one of these trees from a shower of rain, the droppings become charged with its exudations, and produce troublesome sores on any part of the skin which they may touch. The fruit is very beautiful, and looks like an apple, but is filled with a juice similar to that of the tree, but milder ; the burning that it causes in the lips of those that bite it, guards the careless from the dangers of eating.

Hura crepitans, the sand-box tree, a tree of the spurge tribe, has also a very poisonous juice, violently purgative, and if it gets into the eyes produces blindness, with intolerable pain. Its seeds are said to have been administered to negro slaves, in doses of one or two, as purgatives, but

with fatal consequences. Its capsule has the curious property, when quite ripe, of bursting with a loud report like a pistol, scattering the seeds with great force ; many of our native euphorbias exhibit the same property in a slight degree, as may easily be observed by gathering a few of the riper capsules, and spreading them on a paper in a dry warm place. It is a native of Jamaica. The inner bark of *Lagetta lintearia* is the beautiful lace bark, so called because when macerated and stretched laterally, it assumes the appearance of coarse lace ; twisted and knotted, it was formerly employed in making the slave whips used by negro drivers.

In the thick woods of the Sandwich Islands, an endless mass of tree ferns, screw pines, (*Pandanus*,) and others, are so closely interwoven by the various species of ipomœa, that all the climbing-plants must be torn down in order to force a path. In some parts, the screw pines, and plants of the pine apple tribe, (*Ananas*,) appear in great numbers ; “ they climb up the trunks of the trees, and surround them with hundreds of branches, so that their foliage is impenetrable, and the traveller must pursue his journey upon this matting of vegetation ; at last he walks, without perceiving it, at a height of eight or ten feet above the surface of the earth, and it is only where he reaches a fissure in this mountain of plants that he can survey the enormous mass.” The pandanus, or screw pine, has a singular appearance ; it has long, narrow, shining green leaves, which grow

in spiral lines round the tall stems, and cover them to the top. Some of these are upright, others climbing plants, and are never branched except when very old. Some very singular species of pandanus have their trunks covered with roots, which descend to the ground like tightly-drawn cords, and support the main trunk. One species (*Pandanus odoratissimus*) is very common in the South Sea Islands; its flowers are of such delightful fragrance, that it is often cultivated in Egypt and Arabia for their sake. Its fruit reaches the size of a child's head, and much resembles the pine apple. The pine apple tribe are especially luxuriant in this, as well as in the equatorial zone. The pine apple, which is cultivated in our hot-houses, is found wild in abundance in the Molucca Islands, and in many parts both of Asia and America. In Surinam, Brazil, and the Indies, it is used for inclosing the fields, and forms thick hedges, while its sharp-edged and toothed leaves effectually keep out all animals. It was first cultivated in England at the end of the seventeenth century, but so successful have been the efforts to improve its cultivation, that the fruit grown in England is more prized than that cultivated abroad.

The multitude of islands, termed Polynesia, form a botanical district by themselves. Composite, or syngenesious plants, with tree ferns, constitute the principal portion of the vegetation. Ferns are so numerous that there is one species of them for every three or four flower-

ing plants, while in tropical Australia and India the proportion is as one to twenty-six. The cocoa-nut abounds; the bread fruit, of which fifty varieties are indigenous, yields three or four crops annually. The banana, (*Musa paradisaica*,) with several allied species and varieties, is plentiful throughout the islands; an acre of ground, planted with bananas, will produce one hundred and thirty-three times as much food as if planted with wheat, and forty-four times as much as with potatoes. Still, as the banana is not so nutritious as these, it will not suffice to support so many individuals as would appear at first from these statements. Humboldt calculates that a banana plantation will support about twenty-five times as many individuals as the same extent of ground sown with wheat. Perhaps there is no other plant whose produce is so immense. It is to the inhabitants of some tropical countries what wheat, barley, and rye, are to the inhabitants of Europe and Western Asia, and what the numerous varieties of rice are to those of the countries beyond the Indus. The labour of cultivating it is very slight, and its growth very rapid, while it flowers and bears fruit through the whole year. Humboldt remarks, that a European traveller, newly arrived in the torrid zone, is struck with nothing so much as the extreme smallness of the spots under cultivation round a cabin which contains a numerous family of Indians. Thirty-six good-sized fruits are sufficient to support a man entirely for

a week, and they are eaten either fresh or dried. A single cluster of bananas, produced upon a single plant, often contains from one hundred and sixty to one hundred and eighty fruits, weighing altogether from seventy to eighty pounds. Yet this facility with which food can be procured has doubtless contributed to retard the progress of improvement in tropical regions, while the necessity of the European has called forth his industry; and that, under his colder skies and less fertile soil, has surrounded him with all the blessings of society, its comforts, its affections, and its intellectual riches.

The taro plant (*Colocasia macrorhiza*, or *Arum esculentum* of former botanists,) is one of the most valuable of the productions of the South Sea Islands. It belongs to the arum tribe, and is cultivated for the sake of its roots, which afford an excellent and nutritious food, and are eaten either roasted or boiled. They require a low and wet ground, abundantly supplied with water, and are planted a yard apart, to allow full room for the growth of their tubers. They are fit for use in six months after being planted, but are much improved by being permitted to remain in the ground a year. In that portion of China which lies in this zone, the Chinese pine forms woods as extensive as the common pine with us and in the north of Europe, and contrasts strikingly with the airy groves of the bamboos and arborescent grasses. In Madagascar *Tanghinia venenifera* occurs, which is one of the most active and virulent

of known poisons. The kernel of the fruit, though not larger than an almond, is sufficient to destroy twenty people. It was used in Madagascar as an ordeal, but is now discontinued.

3. *The Sub-tropical Zone* extends from the tropics to 34° N. or S. lat. Its mean temperature is from 62° to 69° Fahr., and with an average summer heat of from 73° to 82° . Its climate is one of the most delightful on the globe, and many of the tropical fruits, with many plants which properly belong to the equinoctial zone, are found in it, while the winters are so mild that man scarcely needs the substantial dwellings of colder climes. It embraces the north of Africa, including the Great Desert, Morocco, Barbary, Algiers, Tunis, Tripoli, and Egypt; in Asia, Palestine, Syria, the north of Arabia, Persia, Cabul, Beloochistan, Thibet, the north of India and China; the southern part of Australia; South Africa; Paraguay, La Plata, Chili, Banda, in South America; the Bahamas, Bermudas, Mexico, Texas, the Southern States, and California, in North America. The vegetation of this zone is very interesting and very important. Like the damper regions of the tropical zone, the plants are green all the year round. A number of succulent plants, of the house-leek, stonecrop, *Mesembryanthemum*, and other tribes, are distinguishing features of this zone, especially in Africa. Many of them have beautiful flowers, while their thick, succulent leaves, with

few pores, defend the juices of the plants from the rapid evaporation which would otherwise be caused by the powerful rays of the sun.

The ice plant is a well-known example of this kind of plants, some few species of which are found in our climate, for example, the common house-leek. In the Island of Madeira, there is a species of house-leek, which attains the form and character of a tree. But some of the most remarkable and peculiar plants of this zone are the large and even tree-like euphorbias, (*Spurges*,) which, with their angular, succulent stems, seem to imitate the cactuses of America. These plants, which are very various in form, are generally of the most acrid and poisonous nature, though some are possessed of exactly opposite qualities, and are both innoxious and nutritious. The number of species of euphorbia and its allied genera, is said to be two thousand five hundred ; by far the greater part of which are tropical, or sub-tropical, and very few inhabit colder regions. It is believed that fully half of the tropical species belong to America. *Euphorbia balsamifera* is a native of the Canary Islands, the milk of which is so innoxious and sweet, that it is thickened to jelly, and eaten by the inhabitants. The cordon, (*Euphorbia Canariensis*,) another denizen of the Canaries, whose juice is as acrid as that of many of the other euphorbias, is a very singular plant. Its dark green, prismatic branches, six inches in circumference, completely leafless, and edged with pairs of short prickles, rise all

at once from a common root, bend down in a semicircle to the ground, and then rise again perpendicularly at various distances from the first root, so that the tree resembles an enormous lustre, with a number of branches bearing lights. At the extremity of these thick, fleshy branches, break forth the scarlet flowers, which, at a distance, are like burning coals. In Africa and Asia, the leafless thorny euphorbias are often planted for fences, and they serve most effectually to keep out intruders, injuring those who attempt to pass, not only by their sharp spines, but by the poisonous juices they instil into the wounds made by them. To this zone belong also many of the fig tribe.

The common fig is the produce of *Ficus carica*, and the wholesomeness of the fruit is remarkable, inasmuch as the juice of the tree itself is very acrid. 22,768 cwts. of figs were imported into this country in 1848, chiefly from Turkey and the Levant. The fig seems to have been to the natives of the east in former days, what the banana is to the Indian tribes of South America at this day. With little trouble of cultivation, and whether fresh or dried, it supplied their principal necessities, and its failure was considered by the Jews a most grievous calamity. "Although the fig tree shall not blossom, neither shall fruit be in the vines; the labour of the olive shall fail, and the fields shall yield no meat; the flock shall be cut off from the fold, and there shall be no

herd in the stalls; yet I will rejoice in the Lord, I will joy in the God of my salvation," is language expressive of the firm confidence in God which the prophet entertained, amidst the most terrible famine, and the greatest earthly calamities.

In Egypt and Palestine grows the sycamore of Scripture, which is not the same tree as the one known by that name in this country. The latter is a species of maple—the sycamore of Palestine is a species of fig, (*Ficus sycomorus*.) It is a wide-spreading tree, fifty or sixty feet high, with a trunk often of such thickness that three men cannot embrace it. Probably our Saviour had such a tree before him when he said, "If ye had faith as a grain of mustard seed, ye might say unto this sycamine tree, Be thou plucked up by the root, and be thou planted in the sea; and it should obey you," Luke xvii. 6. Its vigorous branches and beautiful evergreen foliage afford a delightful shade, while its fruit seems to have been an important article of food in Egypt and Palestine, and is still used to a considerable extent. Its importance is noticed in Psalm lxxviii. 47, "He destroyed their vines with hail, and their sycamore trees with frost," evidently implying a heavy calamity. The lower classes in Egypt at this day think themselves well regaled when they have a piece of bread, a couple of sycamore figs, and a jug of water from the Nile. The prophet Amos, we are told by himself, was a "gatherer of sycamore fruit," Amos vii. 14. Its abun-

dance in ancient Palestine is alluded to in 1 Kings x. 27, "And the king (Solomon) made . . . cedars to be as the sycamore trees that are in the vale, for abundance."

The valuable substance, India-rubber, now so extensively employed in the manufactures of this country, is furnished by many species of fig in great abundance. All that is imported from India is the produce of *Ficus elastica*, and various Javanese and American species yield it freely. It is obtained by making incisions into the tree, and collecting the sap as it flows; when hardened by exposure to the air it forms caoutchouc, or India-rubber. It has of late years been very extensively and increasingly used in this country, and especially since the discovery of certain liquids which will dissolve it, so that it may be applied in the manner of varnish, from which, when spread lightly over any substance, the dissolving liquid being very volatile, evaporates, and leaves a very thin film of caoutchouc behind. In this manner the waterproof cloths and fabrics are made, which are now so largely used. Some idea may be formed of the rapidly increasing consumption of this article from the fact, that in 1830 the quantity imported into England was 52,000 pounds; in 1833, 180,000 pounds; while in 1847, 659,568 pounds were imported. Some species of fig, as the banyan, (*Ficus Indica*,) send off shoots from their long horizontal branches, which descend to the earth, and there taking root, become subsidiary trunks, which

at length often become as portly as the parent stem. Milton beautifully describes it—

“ The fig tree, not that kind for fruit renowned,
But such as at this day, to Indians known,
In Malabar or Deccan spreads her arms,
Branching so broad and long, that in the ground
The bended twigs take root, and daughters grow
About the mother tree, a pillar'd shade,
High over-arch'd, and echoing walks between :
There oft the Indian herdsman, shunning heat,
Shelters in cool, and tends his pasturing herds
At loop holes cut through thickest shade.”

There is a tree of it on the banks of the Nerbudda, in the province of Guzerat, with 350 main stems, occupying an area of 2,000 feet, independently of the branches, which extend much further. The number of smaller stems amounted to more than 3,000, and are continually casting out new branches and hanging roots. It is estimated that 7,000 persons might find ample room beneath its shade—

A sylvan temple, arch'd aloof
With airy aisles and living colonnades
Where nations might have worshipp'd God in peace.

Mr. Reinwardt saw in the Island of Simao a large wood of *Ficus Benjamina*, which had sprung from one stem. Milton supposes the leaves of the banyan to have been the fig leaves with which our first parents clothed themselves after the fall. The tenacity of life in some species of fig is very remarkable. A specimen of *Ficus Australis* lived, and grew suspended in the air without earth, in one of the hot-houses in the Botanic Garden at Edinburgh, for eight months, without apparently experiencing any inconvenience. The whole tribe of fig trees,

indeed, including many more species than those we have briefly noticed, is one of the most marked peculiarities of a tropical scene.

The Canary Islands are celebrated for a very remarkable tree, the dragon's blood, (*Dracæna draco*.) One of these trees, at the Villa Oratava, in Teneriffe, has been stated to be between seventy and seventy-five feet high, and forty-six and a half feet in circumference at the base ; it was a very ancient tree in the year 1402, and is still alive and productive. It yields a deep red resin, called dragon's blood ; but the substance sold in our shops under that name is the produce of some palms, of the genus *Calamus*.

In the north of Africa, we find the great Desert of Sahara, which occupies a large portion of the sub-tropical part of that continent. Of course, on the desert itself we do not expect to discover any trace of vegetation ; except that here and there, where a spring arises, a spot of verdure is seen, called an oasis ; here palms, acacias, and other prickly plants, are found. On the borders of the desert, at the base of the Atlas range, the date palm forms large forests, nourished by the moisture which descends from the mountains, and affords food to the inhabitants, and shelter to crops which could not otherwise grow ; for the drought on the borders of the desert is so excessive, that no other trees can resist it, rain hardly ever falls, and the scorching blasts from the south speedily dry up any moisture that may exist. The desert has

greatly extended its boundaries within the limits of history; considerable portions of Egypt, which were once covered with a rich vegetation, and studded with populous cities, are now sandy wastes, and cities, temples, and palaces, are buried beneath the sands—while it bids fair to overwhelm still more and more of that ancient and fertile country. But we must look a little at the vegetation of this part of the world.

The papyrus is one of the most interesting plants of Egypt, having been used by the ancients as a material for writing upon long before the invention of paper. Our word “paper” is, indeed, derived from the name and use of this plant. It is one of the sedge tribe, (*Cyperaceæ*) inhabiting stagnant pools and lakes, though sometimes found in rapid streams. The stems were the part used by the ancients, and their thin plates of cellular tissue were united by moistening and pressing them together, so as to form a sheet, their substance being of so adhesive a nature as to require no other cement. Sheets of large size were thus formed. Belzoni had one twenty-three feet long by eighteen inches broad. Large quantities were exported to Greece and Rome, where it was the only material used for writings intended to be preserved, until the invention of parchment, B.C. 250. Papyrus, however, still continued to be in demand till the invasion of Egypt by the Saracens, in the seventh century, when parchment was generally substituted for it.

The quantity made by the ancient Egyptians must have been very great, judging by the number of rolls often found in the tombs and mummy cases. In the museum of Naples, there are nearly one thousand eight hundred mss. of this description, which have been dug out of a small part of the city of Herculaneum, whence the number that must have existed in the Roman empire at that time may in some degree be imagined. The papyrus is doubtless the plant alluded to in Scripture as the bulrush, of which the ark was made for the infant Moses, (Exod. ii. 3,) and also the vessels of bulrushes in which men sailed, (Isa. xviii. 2.) Pliny notices "ships made of papyrus;" and in another place he says, "of the papyrus itself they construct sailing-vessels."

It is singular that, even at the present day, the leaves of the date palm are used to form a sailing-vessel, which is much employed in crossing the Tigris. They are woven into a kind of basket-work, and are thickly coated with bitumen to render them water-proof. Egypt was once celebrated as the granary of Europe, and was the most fertile country in the world. In Gen. xli. 47, it is said, that during the seven years of plenty, "the earth brought forth by handfuls," that is, probably, each stalk produced as much as the hand could grasp. Such productiveness, or even more, is not unusual at this day. Mr. Jowett pulled, at random, a few plants from a corn-field in Egypt, to ascertain how many stems grew

from one grain of wheat. The first had seven stalks, the next three, the third eighteen, the fourth fourteen. Each stalk bore an ear. It often happens that one stalk will bear two ears, while each of these ears will branch out into a number of lesser ones, thus affording a plentiful increase. Egypt is indebted for its fertility to a system of artificial irrigation, established in the times of its ancient prosperity. To the same cause the plain of Lombardy formerly owed its richness, and its inhabitants their opulence, and we may add, their liberty, when the nations of Europe were immersed in ignorance and barbarism.

The cucumber and the gourd have been cultivated in Egypt from the earliest times. "We remember," said the Israelites in the wilderness, "the fish which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlic," Num. xi. 5; and these cooling vegetables, the water melon particularly, still form the great part of the food of the lower class of the people in Egypt during the summer months. "A traveller in the east, who recollects the intense gratitude which the gift of a slice of melon inspired while journeying over the hot and dry plains, or one who remembers the consciousness of wealth and security which he derived from the possession of a melon, while prepared for a day's journey over the same plains—he will readily comprehend the regret with which the Hebrews in the Arabian desert looked back upon the melons of Egypt." Garlic

and onions have been esteemed in Egypt from very early times ; and Hasselquist shows, that there is good reason for the superior value there set on them. "Whoever," he says, "has tasted onions in Egypt, will allow that none better are to be had in any part of the universe. Here they are sweet, in other countries they are nauseous and strong ; here they are soft, whereas in the northern and other parts they are hard. Hence they cannot in any place be eaten with less prejudice and more satisfaction than in Egypt."

Most of the people of western Asia are remarkably fond of onions, and the Arabs are passionately so. The garlic of Egypt was formerly much esteemed ; Dioscorides says, that garlic anciently grew very plentifully in Egypt ; and Herodotus tells us, that in his time there was an inscription on the great pyramid, recording the expense of the onions, radishes, and garlic, which had been consumed by the workmen during the progress of the undertaking. The cucumber of Egypt is far less apt to disagree with the stomach than those grown in England ; indeed, when in season, they are eaten by all classes to an extent which would scarcely seem credible in this country. In Syria, the cucumber was cultivated in open fields, far from the habitations of men ; and here a hut was erected for the watchman, who guarded the fruit from foxes and jackals. Bishop Heber saw in India a man in a small shed of bamboo and thatch, thus watching a field of cucumbers.

The language of Isaiah recurred to his mind, when, speaking of the desolation of Judah, he says, "The daughter of Zion is left as a cottage in a vineyard, as a lodge in a garden of cucumbers." But the force and truth of the figure were still more strikingly seen, when, a short time after, returning the same way, the crop was gathered, the hut destroyed, the bamboos lying in every direction, the thatch scattered, and all was desolation and destruction. In Egypt, the doum and date palms abound; these we shall notice again presently.

In Arabia, we find the colocynth, a plant of the melon tribe, inhabiting also the Levant. It is, however, a very active purgative, and is much used at the present day in medicine. The wild vine, producing the poisonous gourds spoken of in 2 Kings iv. 38—41, and which, while occasioning the alarming cry, "O thou man of God, there is death in the pot," gave opportunity for the miracle performed by Elisha, is supposed to have been this plant. A still more active plant is the *Momordica elaterium*, or squirting cucumber, the dried juice of which is one of the most violent purgatives known, a few grains having destroyed life. It is, however, useful in dropsy, but one-eighth of a grain is a sufficient dose. It is probably the "vine of Sodom," spoken of in Deut. xxxii. 32. A species of luffa, a South American cucurbitaceous plant, possesses similar qualities. These all inhabit the same latitudes as the cucumber, gourd, etc. Arabia is also

the country of gums and balsams, a large number of its plants and trees abounding in such exudations. Gum arabic is obtained in large quantities from *Acacia vera* and *A. arabica*. The best and whitest comes from the last-named species. It is gathered in vast quantities from the trees growing in Arabia Petræa, near the foot of Mount Sinai; and is so nutritious, that the Moors who collect it live almost entirely upon it during the whole of the gum harvest, which lasts five weeks, and the subsequent journey of transport. Gum senegal, an inferior kind of gum arabic, is the produce of *Acacia senegal*, a tree which inhabits Arabia and the interior of Africa, and sometimes forms large forests. In 1839, 15,628 cwt. of gum arabic, and 24,698 cwt. of gum senegal, were imported into this country. Several other species of mimosa and acacia also inhabit Arabia.

The balm of Mecca is the produce of a tree growing between Mecca and Medina, (*Balsamodendron opobalsamum*,) and the balm of Gilead of another species of the same genus, (*B. Gileadense*,) also a native of Arabia. The balm of Gilead was held in very high estimation in the most ancient times, as a medicine and cosmetic. The Ishmaelites carrying Arabian commodities into Egypt, made it part of their merchandise, (Gen. xxxvii. 25;) and it was among the presents which Jacob sent to Joseph while ruler of Egypt, (Gen. xliii. 11.) The value which was set upon it as a healing medicine of extraordinary virtue,

may be seen from the mention of it by the prophet: "Is there no balm in Gilead; is there no physician there? why then is not the health of the daughter of my people recovered?" Jer. viii. 22; "Go up into Gilead, and take balm, O virgin, the daughter of Egypt: in vain shalt thou use many medicines; for thou shalt not be cured," Jer. xli. 11; "Take balm for her pain, if so be she may be healed," Jer. li. 8. According to Pliny and Justin, it was anciently so abundant in the vale of Jericho, that there were whole parks of balsam trees there; and we know from Scripture that it grew in Gilead, on the Syrian side of the Jordan. Now, however, it has totally disappeared from Palestine, and is only to be found in Arabia, which seems to be its native country. It is procured by incision in the tree, but the quantity collected is very small. The large park in the vale of Jericho only yielded six gallons in the most plentiful year, and it was formerly sold for double its weight in silver. It is still esteemed very precious, and is rarely to be procured genuine, that which is collected being hardly sufficient for the scraglio and great officers. It is said to be exceedingly fragrant.

Myrrh is a product of a plant of the same genus, (*Balsamodendron myrrha*), a tree which grows in considerable quantity on the borders of Arabia Felix. The myrrh of Scripture is, however, not perhaps identical with the gum we call by that name, but probably is the same as the balsam of Mecca, or the kataf of the

Arabians. Tamarisks abound in the deserts of Arabia, and, with their pretty spikes of small pink flowers, enliven the gloom of those barren wastes. One species of tamarisk (*T. Gallica*) is commonly cultivated in many of our gardens, especially on the coast, and gives a good idea of the character of the genus. Two species (*Tamarix orientalis* and *T. passerinoides*) grow in Arabia; the former is probably the plant mentioned in Jer. xvii. 6, "For he shall be like the heath in the desert, and shall not see when good cometh; but shall inhabit the parched places in the wilderness, in a salt land and not inhabited." Its spare and neglected form peering above the sand of the desert, might well be taken as an emblem of desertion and solitude.

One of the most cherished plants of Arabia is the henna, (*Lawsonia inermis*), a plant of the loosestrife tribe, which is in universal estimation for its beauty and sweet perfume. It is a native of India, Arabia, Persia, Egypt, and Greece, and is not only found wild, but is universally cultivated. Mohammed, speaking of this flower, called it "the chief of the sweet-scented flowers of this world and the next." Mr. Lane says, "I approve of his taste for this flower, which grows in clusters, somewhat like the lilae, and has most delicious fragrance." The light green foliage, the yellowish white flowers, and the coral-red flower-stalks, give an elegant appearance to the shrub. It is supposed to be the plant alluded to in Solomon's

Song i. 14, "A cluster of camphire in the vineyards of En-gedi," which corresponds to the beautiful long clusters of flowers of the henna, but by no means to what we call camphor. It is also alluded to again in the same book, chap. iv. 13, 14, "Pomegranates, with pleasant fruits; camphire, with spikenard, spikenard and saffron; calamus and cinnamon, with all trees of frankincense; myrrh and aloes, with all the chief spices;" and these are all still highly esteemed in the east.

Its blossoms form the favourite bouquet of the Grecian females, who delight peculiarly in flowers, and wear them in profusion about their persons. The oriental ladies also deck their sofas and adorn their houses with the rich blossoms of the henna; and the Egyptian females carry them in their hands and place them in their bosoms, as well as keep them in their apartments. The aged Mohammedan frequently perfumes his beard, by holding his face over the vapour arising from a preparation of these sweet flowers. This reminds us of the perfume which, poured upon Aaron's beard, was, in its sweetness, compared by the psalmist to the delights of fraternal affection. In Egypt, the henna flowers are carried about the streets for sale, and the seller, as he walks, cries, "Oh, the odours of paradise: oh, flowers of the henna." The rose, which is esteemed the queen of flowers, is even considered by the orientals inferior to the henna. The dried leaves of the plant are used by eastern females

to impart a pink dye to their nails, palms of their hands, and soles of their feet, and this is considered a great ornament.

Delicious as is the perfume of the henna, another Arabian plant, of much less outward pretensions, has been far more extensively beneficial in its utility to man; this is the coffee shrub, a native of Arabia Felix, and the table-land of Ethiopia. It derives its name from the province of Kassa, where it forms dense forests. The plant does not seem to have been known to the Greeks and Romans, nor are there any facts known as to the origin of its use in the east. The coffee plant was brought from Mocha to the Botanic Garden at Amsterdam, in 1690; and the magistrates of that city, in 1714, sent a plant of it as a present to Louis XIV. From this latter plant the first coffee plants were introduced into the West Indies, in 1717, where it has rapidly spread, and is now extensively cultivated in Jamaica, Demerara, etc. In 1718, it was introduced by the Dutch into Surinam, from whence it was quickly diffused over equinoctial America. It was not known as an article of diet for many centuries after the introduction of sugar. The first coffee-house was opened in England in 1652, and the first in France in 1671. That in England was commenced by the Greek servant of Daniel Edwards, a Turkish merchant; his handbill is still extant, in which he announces "the virtue of the coffee drink first publicely made and sold in Eng-

land by Pasqua Rosce, in St. Michael's Alley, Cornhill, at the sign of his own head."

When it is considered that it was made strong, and drunk without sugar or milk, it may be believed that it was not much liked; one person describing it as being as black as soot, and tasting not much unlike it. For twenty years after its introduction it was the subject of general invective, both as to medicinal and domestic use. When first introduced into Turkey, it was forbidden by the government on the ground of its being an intoxicating beverage! and the Mohammedan priests complained that the people forsook the mosques, and crowded to the coffee-houses. Now, however, it has long been a necessary of life in that country; so that at one time the refusal of a husband to supply his wife with a reasonable quantity of it, was reckoned among the legal causes for a divorce. When first introduced into England it was worth four or five guineas per pound; but, by degrees, the consumption increased, till, in 1808, 1,000,000 pounds were imported, the duty being then two shillings per pound. In 1824, the duty was lowered to sixpence, when it increased rapidly; in 1839, it had reached 27,000,000 pounds, and in 1848, 57,061,431 pounds were imported. The best coffee is still imported from Mocha, in Arabia, but very large quantities are brought from the West Indies, Java, and Ceylon.

Between the desert of Arabia and the Medi-

terranean is the Land of Promise—a land, as Moses described it, “of wheat, and barley, and vines, and fig trees, and pomegranates; a land of oil olive, and honey,” Deut. viii. 8. And such it still is proved to be, wherever the inhabitants, rescued from oppression the most grinding, are permitted to cultivate their lands with any fair prospect of reaping in peace the fruit of their labours. Palms, corn, pomegranates, figs, cedars, the olive, and a great variety of interesting plants, characterise this country; but we must notice them a little more in detail. Two of the palms are found in Palestine, and were known to the Jews—the doum palm, (*Crucifera thebaica*), and the date palm, (*Phœnix dactylifera*.) The doum palm is remarkable for its forked stem, which is divided into two at some height from the ground, and these branches again subdivide in a similar manner. It abounds also in Egypt, where it is called the gingerbread tree, from the extreme resemblance of its brown mealy rind to that article. Its hard kernels are turned for rosaries.

But *the* palm, by way of eminence, is the date palm. It is to this probably that the numerous allusions in Scripture refer. This palm belongs to the western part of the subtropical zone in the old world, beginning at the Canary Isles, and embracing Egypt, Palestine, Syria, and Arabia, in its eastern range. It is not found spontaneously east of the Indus. It has been artificially cultivated in India and

Batavia, and as far north as Nice. That part of Africa called Billedulgerid is literally the land of dates. It requires a sandy and well watered soil, and in the Great Desert of Africa is only found near springs. Here it not only affords food to the traveller, but its leaves are excellent fodder for the beasts of burden. Its presence is an unerring sign of water; hence, the weary Israelites found water when they found palm trees—"And they came to Elim, where were twelve wells of water, and threescore and ten palm trees," Exod. xv. 27. The date palm is an example of extraordinary fruitfulness, a single spathe containing twelve thousand male flowers; and its fruit, of which one hundred and fifty to one hundred and sixty pounds' weight are yielded by each tree, forms the chief support of the inhabitants of the barren parts of Arabia and Egypt.

The palm reaches maturity in about thirty years, and continues in full vigour about seventy years longer. It is beautifully applied in Psa. xii. 12, 14, "The righteous shall flourish like the palm tree: he shall grow like a cedar in Lebanon. They shall still bring forth fruit in old age; they shall be fat and flourishing." It is diœcious, that is, the stamen-bearing flowers, (males,) and those containing pistils, (females,) grow on different plants. Plants of this kind are usually fertilized by the pollen being conveyed from one flower to the other by insects, the wind, etc.

In the date palm, however, these means often fail, and if unseasonable weather or accident prevent it, the date crops are entirely ruined. To prevent this, the Arabs, who have been acquainted with these facts for ages, gather the clusters of male flowers, and hang them over the pistilline ones, and they even lay up stores of pollen from year to year. In incursions into hostile territories, the invading army often cuts down the stamen-bearing palms, as one of the most severe injuries they can inflict upon their enemy. It is on record, that the threat of doing so, on the part of those attacked, once warded off an invasion. The grand seignior having meditated an invasion of the city and territory of Bassora, the prince of that country prevented it, by giving out that he would destroy all these palms on the first approach of the enemy, and by that means cut off all supply of food from them during the siege. Most of the inhabitants of Persia, Arabia, and Egypt, subsist principally upon its fruit. The harvest of dates is expected, therefore, and attended with as general rejoicing as the vintage of the south of Europe. The crop sometimes fails, or is destroyed by locusts, and then an universal gloom overspreads the population. "What is the price of dates at Mecca or Medina?" is always the first question asked by a Bedouin who meets a traveller on the road.

That the date palm was anciently very plentiful in Palestine we have abundant proof; ancient writers bear testimony to it, and on the

medals of no less than four Roman emperors, Vespasian, Titus, Domitian, and Trajan, it is employed as an emblem of the Hebrew nation, or portions of it; and the palm tree in Judæa does still mournfully typify the desolate condition of the Hebrew people. It was prosperous in their prosperous days, and has become desolate with their desolation. Palestine is not now the country of the palm; Jericho, anciently called "the city of palm trees," has but few comparatively around it; and scattered over the land, two or three palm trees are rarely seen together. Branches of the palm were anciently used as symbols of victory and triumph, both among Jews and Gentiles. Thus, when our Lord rode in triumph into Jerusalem, the people "took branches of palm trees, and went forth to meet him, and cried, Hosanna!" etc., John xii. 13. So, also, the redeemed in heaven, in token of their ascribing victory to Him who conquered sin and death, are represented as standing "before the Lamb, clothed with white robes and palms in their hands."

But we must hasten to notice some others. The fields of Palestine are often studded in the autumn with the *Amaryllis lutea*, a beautiful plant of the lily tribe, resembling our crocus, but larger. It sometimes covers whole acres of ground with its brilliant flowers in September and October, and is supposed to be the plant alluded to by our Saviour, when he bade his disciples "consider the lilies of the field, how

they grow ; they toil not, neither do they spin : and yet I say unto you, 'That even Solomon in all his glory was not arrayed like one of these,' Matt. vi. 28, 29. Many other liliaceous plants, of varied form and beautiful colours, adorn the plains of Palestine and other tropical countries, often abundant as the buttercups and wild flowers of the meadows of our native land. A singular plant, called the rose of Jericho, (*Anastatica hierochuntina*,) a plant of the cruciform order, is a native of Palestine, Syria, and Arabia. When full-grown it contracts its rigid branches into a ball, which is easily withdrawn from the sand by the wind, and hurried from place to place. But as soon as it is exposed to water the branches relax and spread flat, as if its life were renewed, and this will take place after the plant has been many years dried up. Some superstitious tales are told of it, among which it is said to have bloomed on Christmas-eve, to salute the birth of the Redeemer, and to have paid homage to his resurrection by remaining expanded till Easter.

The cedar of Lebanon is peculiar to Palestine, having been found nowhere but on the mountain whose name it bears. The cedars are now but few in number. It is, however, generally considered that the "cedar" so often mentioned in Scripture, was not the tree we now understand by that name, as its timber is comparatively valueless, and has but little fragrance. It was, doubtless, some coniferous

tree, most probably the *Juniperus oxycedrus*; Theophrastus describes a species of juniper as bearing the name of "cedar," being peculiar to Syria and Phœnicia, and used for nautical purposes, thus agreeing with Ezek. xxvii. 5, "They have taken cedars from Lebanon to make masts for thee." Various trees of this kind inhabit Palestine, some of which afford excellent timber; among others, the Scotch fir, (*Pinus sylvestris*,) and it is believed *Pinus laricio*, *P. halepensis*, and *P. orientalis* also.

Another remarkable tree is the olive, which gives its name to Mount Olivet. It is truly an interesting and curious fact, that during a period of little less than three thousand years, Hebrews, Assyrians, Romans, Moslems, and Christians, have been successively in possession of the rocky mountains of Palestine; yet the olive still vindicates its paternal soil, and it is found at this day upon the same spot which was called by the Hebrew writers the Mount of Olives, 1100 years before the Christian era. The wood of the olive is beautifully veined, it takes a high polish, and having an agreeable smell, is much esteemed for ornamental work. The appearance of the tree is not unlike that of our willows, but the fruit, which is its chief value, is like a damson to the eye, with a soft oily pulp, and a hard stone in the centre. From this fruit the oil is procured by expression, the pulp having been first ground in a mill. The best oil is obtained from Italy, Sicily, and Provence, and throughout

the southern countries of Europe it is very extensively used, being employed as generally and in the same way as butter and cream are with us. The quantity imported into this country in 1848 was 2,518,740 gallons.

There was anciently an enormous consumption of it in Palestine; it was used, doubtless, as it still is in southern Europe; it was also used in the temple for the lamps, which were kept burning continually, (Exod. xxvii. 20.) Great, however, as was the consumption, the produce was so abundant as to leave a considerable quantity for exportation. Solomon gave 20,000 baths (150,000 gallons) of oil yearly to the Tyrian hewers of timber in Lebanon, (2 Chron. ii. 10,) and, as it would appear, an equal quantity to the king of Tyre himself, (1 Kings v. 11.) It appears, too, that the Jews traded with their oil in the great mart of Tyre, (Ezek. xxvii. 17,) and sent it to Egypt, (Hosea xii. 6.) To this day, the olives and olive oil of Palestine are equal to any in the Levant. Branches of the olive tree were used as one of the materials of the booths at the feast of tabernacles, (Neh. viii. 15;) and an olive branch has long been considered the symbol of peace. The dove which Noah sent forth on the abating of the waters of the deluge, returned with an olive leaf plucked off; the hardiness and tenacity of life of this tree, probably enabling it to withstand so long an immersion in the waters of the flood. The olive is now cultivated and naturalized over

all the south of Europe, but it appears to have originally come from Asia, and grows wild abundantly about Aleppo and Lebanon. Its longevity is great. Some plantations of it in Italy, as at Terne, are supposed to have existed from the time of Pliny; and in Judæa and Galilee, clumps of several thousand olive trees frequently occur, which are, doubtless, the remains of ancient plantations.

But we must hasten to mention a few other plants of Palestine. It is an interesting country in its flora, and deeply so in its associations, and this must be our excuse for dwelling on it so long. The cypress grows there, and appears to be the "gopher wood" of which the ark was built, (Gen. vi. 14.) Some species of acacia are also found; the wood of one of which, (*Acacia horrida*), a thorny tree, seems to have been the "shittim" wood used in constructing the ark of the testimony, the altar of burnt offering, the boards of the tabernacles, etc., (Exod. xxv.—xxvii.) and deserves the name given to it by the Greek translators, meaning "wood that never decays." The pomegranate is, and was, very common in Palestine and Syria. It was one of the productions which Moses especially distinguished in his address to the Israelites, as characterising the rich fertility of the land. The fruit was also one of the three kinds which the spies brought as favourable specimens of the produce of the country. The flowers and fruit are both very beautiful; the latter is about the size of an orange, very juicy,

and of an agreeable acid taste. It is still very highly esteemed; it is eaten fresh, and its juice is used as an ingredient in the favourite and delicious sherbets of which the orientals are so fond. It is repeatedly alluded to in Scripture. It is specified by the Israelites while murmuring at Moses, as one of the greatest luxuries they enjoyed in Egypt, (Num. xx. 5.) In Solomon's Song it is mentioned as one of the most valued plants, (chap. iv. 13;) and imitations of the fruit were among the chief ornaments of the temple.

The oak (*Quercus robur*) is frequently found in Palestine, but the tree mentioned in Scripture under that name is generally considered to be the terebinth tree, (*Pistachia terebinthus*.) It yields a resinous substance, as do several allied species. The produce of the terebinth is called scio, or cyprus turpentine; gum mastic is the produce of *Pistachia lentiscus*; and the pistachio nuts are the fruit of *P. vera*. It was under a terebinth tree that Abraham entertained the angels, (Gen. xviii. ;) and under a similar one in Shechem Jacob buried the idols brought by his people from Mesopotamia, (Gen. xxxv. 4.) It abounds near Jerusalem.

The carob tree (*Ceratonia siliqua*) is plentiful in Palestine, as also throughout the south of Europe. It is a tree from thirty to fifty feet high, with small bunches of red flowers, and is cultivated for the sake of its pods, which contain a dry pulp, in which the seeds are imbedded.

This pulp is very nutritious, and is supposed by some to have been the food of John the Baptist in the wilderness, whence it is called "Locust tree," and "St. John's bread." It is also supposed to be the "husks that the swine did eat," spoken of in the parable of the prodigal son, (Luke xv. 16.) It is still used in Palestine for feeding swine, and in Spain for horses.

But we must not leave Palestine without noticing the myrtle, which is so often found in the vales among the "eternal hills," where all is so calm and tranquil, that, says Dr. Kitto, it naturally becomes associated in the mind with everything that is lovely and peaceful. It offered a choice emblem of peace and quietude, and gave a lively freshness to the annunciation of the angel, as he stood among the myrtle trees, "We have walked to and fro through the earth, and behold, all the earth sitteth still, and is at rest," (Zech. i. 11.) One variety is called the Jews' myrtle, and has its leaves in threes at each joint. It is still in much request among them, and yearly do they observe the feast of tabernacles, though they cannot do it as once they did, when Ezra exhorted them, in conformity with the Mosaic ritual, to "go forth unto the mount, and fetch olive branches, and pine branches, and myrtle branches, and palm branches, and branches of thick trees, to make booths, as it is written," Neh. viii. 15. The myrtle here referred to is the common myrtle, which was then, and is

still, very abundant in Judæa. The beauty, loveliness, and fragrance of the myrtle, are striking emblems of the moral paradise which is destined to be produced, when the gospel shall be universally diffused and obeyed, and of the dispositions it implants in the hearts of those who yield to its influence. "I will plant in the wilderness the cedar, the shittah tree, and the myrtle, and the oil tree," Isa. xli. 19; and again, "Instead of the thorn shall come up the fir tree, and instead of the brier shall come up the myrtle tree: and it shall be to the Lord for a name, for an everlasting sign that shall not be cut off," Isaiah lv. 13. Among the Arabs the myrtle is considered to rival the violet; and they have a tradition that "Adam fell down from paradise with three things—the myrtle, which is the chief of sweet-scented flowers in this world; an ear of wheat, which is the chief of all kinds of food in this world; and pressed dates, which are the chief of the fruits of this world."

India possesses a very rich flora, but the names of many of the plants would possess but little interest for those who are unacquainted with botany. Figs, particularly those of the banyan kind, which have already been noticed, form one of the most striking features of its vegetation. The balsam of our green-houses, and the kidney-bean, we have received from India. The teak tree (or Indian oak) also abounds in India. Its wood is used in ship-building, and is so durable, that In-

dian-built ships, constructed of this wood, often last forty years or more in those seas, where our ships are ruined in five years. The mango (*Mangifera Indica*) produces a fruit as highly valued in those warm climates as the peach is in England. The *Palma Christi*, or castor oil plant, (*Ricinus communis*) is cultivated extensively in the East Indies, United States, and West Indies, for the sake of the oil obtained from its seeds, (castor oil,) which is so largely used in medicine. It attains in its native climate the height of a tree, though in this country it can only be grown as an annual, three or four feet high. It is of very rapid growth, and is now generally supposed to be the plant which our translators have rendered "a gourd," which "came up in a night, and perished in a night," for the comfort and the instruction of Jonah ; though so rapid a growth as this must have been miraculous. The fathers, Jerome and Augustine, differed so much as to the particular plant intended by this gourd, that we are told from words they proceeded to blows.

Some of the grasses of India are very fragrant. One (*Andropogon schænanthus*) is called the lemon grass, and yields a perfume very much like the lemon plant, or verbena, (*Aloysia citriodora*), which is so often cultivated in our gardens and cottage windows. The essential oil distilled from it is imported into this country, and used in perfumery. Another species of the same genus (*Andropogon calamus aro-*

maticus) is considered to be identieal with the calamus of Dioscorides, and also with the "sweet calamus," which was one of the ingredients in the "holy anointing oil of the sanctuary," Exod. xxx. 23. The same plant is mentioned in Isa. xliii. 24, "Thou hast bought me no sweet cane with money," alluding to its use in the temple service; and again, in Jer. vi. 20, "To what purpose cometh there to me incense from Sheba, and the sweet cane from a far country?" This plant, and another allied species, (*Andropogon Iwarancusa*), cover the extensive arid plains of central India. The oil is considered very precious by the natives, who use it as a valuable external remedy; and an infusion of the plant is considered a powerful medicine in all kinds of fever. The oil is obtained by distillation, from the flowering spikes, but at the season and in the places where the plant grows, the jungle fever is so very prevalent, that the health and lives of those who collect it are in great danger, and, in consequence, the oil bears a very high price. The greater part of the oil produced is sent now, as in ancient times, as an article of commerce to Arabia. The oil is so highly fragrant, that insects will not approach it, and the odour of the plant itself is so powerful, that though camels will eat almost any vegetable, yet they will not browse on this.

The spikenard of the ancients has been considered by some to have been this plant; the

oil of which was thought to be the "ointment (more properly "attar," or essential oil) of spikenard, very costly," mentioned in Mark xiv. 3 ; but the researches of sir William Jones seem to show, that a plant of the valerian tribe, (*Nardostachys Jatamansi*,) called by the natives "Jatamansi," and by the Arabians "sumbul," was the true spikenard. It grows plentifully all along the Himalayan Mountains, in Nipaul, Bengal, Delhi, Deccan, etc., and is not very unlike in appearance some of the small "forget-me-nots" of our native land. Its attar, or essential oil, forms a principal ingredient in the rich essences and perfumes of the Hindoos, of which the orientals are proverbially fond. They anoint their persons and perfume their clothes with them. Various kinds of these essences were articles of commerce in very ancient times, such as those of roses, cetaca, or pandanus, aguru, or aloes-wood, etc. ; being imported by the Arabians from India, and by them carried to Rome, Greece, Judæa, etc., where they bore very high prices ; the small box (or rather flask) of spikenard, mentioned above, being worth more than £9. 7s. 6d. of our money. The spikenard (*Jatamansi*) is still highly esteemed in India, and is annually brought down from the Himalayas in large quantities.

One of the most valuable productions of India is the cotton, of which at least five or six species are natives of India, yielding cotton of various degrees of value. Of all these, how-

ever, *Gossypium herbaceum*, is the most generally cultivated throughout the world. It is a native of India, Africa, and Syria, but is extensively cultivated in India, Asia Minor, Egypt, Syria, Greece, Sicily, Italy, Malta, the south of Spain, North America, etc. Some other species are cultivated in particular places, as *Gossypium Nanking*, in China and the South Sea Islands, from which the fabric called "Nankeen" is made. *Gossypium religiosum* is cultivated in Sicily and Greece; *G. vitifolium*, around Cairo, at Rio Janciro, and the West Indies; and *G. Barbadosense*, in Barbadoes, and generally throughout the West Indies. Cotton succeeds in those countries whose mean temperature is between 61° and 68° Fahr. In some places, as in the Crimea, it ascends to 45° N. lat.; in Asia, even to Astrakhan; in North America, as far as 40° N. lat.; in South America to 30° S. lat. on the eastern coast, and even as far as 33° on the western. The Cape of Good Hope and Australia are the most southerly stations for it. In China and Japan, cotton culture is in a flourishing condition, but the supply is not equal to the demand, and immense quantities are exported from the East Indies to China.

The cotton plants are sown in March, and when finally thinned, they are left at from three to six feet distance from each other. They will last twelve, fifteen, or even twenty years, and in many countries produce two crops every year. In some places, however, the cotton is

treated as an annual. The best plants yield about two and a half pounds of clean cotton, the weakest only about five ounces. They require to be kept free from weeds, especially from the species of *convolvulus*, or *ipomæa*, which would speedily choke them, and, especially in Brazil, are very luxuriant. The collecting of the ripe cotton capsules is a very laborious work, and requires a great many hands in a large plantation; the harvest lasts for several weeks. The greatest difficulty is the separation of the cotton from the seeds; in America this is effected very completely and expeditiously by machinery, but in India by hand. Cotton appears to have been known to the ancients. Herodotus mentions cotton garments 445 years before the Christian era, and the Mexicans manufactured cotton cloth prior to the discovery of America. Its importation into Great Britain has increased with extraordinary rapidity of late years, and to an extent almost unexampled in the history of commerce. In the seventeenth century, the trifling supply required was obtained wholly from Smyrna and Cyprus. In the year 1786, about 20,000,000 pounds were imported. In 1838, the quantity was upwards of 500,000,000 pounds; and in 1848, the enormous quantity of 712,554,080 pounds were imported into this country; while the quantity of cotton manufactures exported in the year 1848, was of the value of £16,770,868; and of cotton spun into yarn, £5,927,956.

The quantity of cotton manufactures, ex-

clusive of lace, patent net, sewing-thread, stockings, and other cotton goods not entered by the yard, included in the above amount, for 1848, was upwards of 1,046,000,000 of yards, which would reach to the moon and back again, and then leave enough to form a band almost all round the earth. These facts will give some faint idea of the vast extent and importance of this branch of our manufactures and commerce. Our principal supply of cotton is from America and Bengal, but the East Indies and Egypt also contribute greatly to the importation. A large portion of the textures manufactured from it is reconveyed to the countries which originally furnished it. When machinery was first introduced into the cotton manufacture, it was made capable of spinning one pound of cotton into yarn one hundred and sixty miles long, and a much greater degree of fineness may now be obtained. The hand-spinners and weavers in India far outdo machinery in the delicacy of their fabrics, some of their muslins being expressively termed "woven air;" but so great is the saving effected by machinery in the production of all other kinds of cotton fabrics, that a large portion of those used in India are exported from Britain, it being a saving of expense to cause the materials thus to undergo the double voyage, though labour in India is so extremely cheap.

The climate of the Himalayan Mountains, as, for instance, about Delhi, is in summer quite tropical, so that almost all the fruits of the

equinoctial zone can be ripened there; while, in winter, the temperature is so low, that often old trees of the well-known tropical fruits perish. During the summer, which is there at the rainy season, there are cultivated in the province of Delhi, rice, indigo, cotton, maize or Indian corn, and some tropical kinds of grain, gourds, ginger, turmeric, etc. In the winter season the appearance of this district is totally different, for then the corn plants of the north are cultivated, such as wheat, barley, oats, millet; also, beans, vetches, coriander, carraway, flax, etc. On the eastern side of the Himalayan chain, in the sub-tropical part of China, and in the south of Japan, some important plants appear for the first time. Here, indeed, some plants of tropical climes extend much further north than in Europe, especially near the sea, as the palms, bananas, arborescent grasses, etc.

Several trees of the *Anacardium* or cashew nut tribe, growing in Japan, China, Burmah, and India, yield a resinous juice, which is used in those countries as a varnish, and generally turns black. They are dangerous, however, to use, as the fumes are of so acrid a nature, as to cause painful and even dangerous inflammation and swelling. Some constitutions are more susceptible of these effects than others. The valuable black hard varnish, called Japan lacquer, is obtained from *Stagmaria verniciflua*; its resin is so extremely acrid, as to cause excoriations and blisters if applied to the

skin; the people of Sumatra consider it dangerous to sit or sleep beneath the shade of the tree. According to Thunberg, it is also obtained from *Rhus vernicifera*, which yields a very beautiful varnish, which will when dry bear the heat of boiling water without injury, but cracks and flies like glass if struck. The beautiful *Glycine sinensis*, with its myriad bunches of lovely blossoms, resembling laburnums, except in their rich lilac colour—the *Olea fragrans*, the sweet-scented blossoms of which are mixed with the finer teas to give them flavour—the *Thuja orientalis*, (commonly called *lignum vitæ*,) the Chinese chrysanthemum, which produces its richly beautiful blossoms of every shade of red, yellow, and white, after almost all our other flowers are past—and the China, or Banksian roses, which are so highly valued among florists, and the lovers of the garden—are all abundant in the Chinese provinces.

Here, also, are the camphor laurel, the aucuba, so frequent and beautiful an ornament of our gardens, the magnificent camellia, and the tea tree. The hydrangeas, so well known as garden flowers in England, inhabit marshes in China, and when cultivated here require large quantities of water. A full-sized one requires as much as ten or twelve gallons a day in warm weather. But the *tea* shrub is pre-eminently *the* plant of China. The plant from which the tea of commerce is obtained, is *Thea Chinensis*, a plant allied to the lovely camellia.

A considerable number of varieties of the tea plant are known, two or three of which have been distinguished by several botanists as distinct species, *T. bohea*, *T. viridis*, and *T. stricta*. China, Ava, the Burman empire, Thibet, Cochin China, Tonquin, and Assam, all cultivate the tea plant, but especially the first of these, where it is found as high as the 40th parallel of north latitude. Chinese writings trace the use of tea back as far as A.D. 265; and ever since the year 763, when a duty of ten per cent. was laid upon it, the government has always derived from it a large revenue.

Plantations of tea are formed by sowing the seeds, which are set more or less regularly. In the first year, the middle shoot is stopped, that it may become more busily and leafy. The gathering of the tea crop does not commence till the plants are four or five years old. They are generally about three feet high, and about three feet apart, and are kept carefully manured. The fresh leaves have nothing of the flavour and odour of the dried tea, which seems to be produced by drying, as that of coffee is by roasting. The leaves are laid upon large iron plates, which are greatly heated, and in large flat iron pans, with somewhat sloping sides. The leaves are first made to shrivel up in these pans, by the application of a gentle heat, with constant stirring, and are then gradually dried by keeping up the heat. After this, the hot leaves are turned out upon mats, and rubbed

with the palms of the hands, and when cool returned to the pans : this is repeated till the tea is perfectly dried. In this way, three pounds of leaves produce one pound of tea. This appears, from the most recent accounts, to be the usual method of preparing green tea ; black tea is said to be prepared from the same kind of leaves, in the same way, except that they are first exposed for some time in sieves to hot steam.

The quality of the tea depends upon the stage of growth at which it is gathered. Early leaves make the best tea ; those picked late in the season a very coarse one. The first gathering of tea leaves commences about the latter end of February, when the leaves are young and unexpanded. This is called imperial tea, and is highly esteemed. Pekoe, or pak-ko, which means "white down" in Chinese, consists of the first downy sprouts or leaf-buds, of three year old plants. Of course, the gathering must be injurious to some extent to the future produce of the shrub ; hence, the tea is both dear, and the production small in quantity. A very costly tea of this kind, never brought to Europe, and known as the "tea of the wells of the dragon," is used only by persons of the highest rank in China. The *real* imperial tea, also, is not, as is usually supposed, the flower-buds, but only a very superior quality as just stated ; it is seldom brought to Europe, that sold under this name being really Chusan tea, flavoured with blossoms of *Olea fragrans*.

“Young hyson,” also, till it was spoiled by the large demands of late years, was a delicate young leaf, called in Chinese “Yu-tsëen”—“before the rains.” As it could not be produced genuine in any large quantity, it has been imitated by cutting up green teas of common quality, and sifting them through sieves of a certain size; and even the coarsest black teas have of late been cut up in a similar manner, and then coloured green with a preparation; and these spurious articles form the bulk of the “young hyson” now sold. The second collection of leaves is made about the beginning of April, and the third in June. The bulk of the last collection is an inferior and coarse kind of tea, a large quantity of which is retained among the Chinese for home consumption.

The finest and most delicate teas are almost entirely retained among the Chinese themselves, for use among the higher orders, and for presents. The middle and some of the coarser qualities are those chiefly exported. Some of the inferior qualities are made into what is called brick tea. It comes into trade in hard cakes, very like thin bricks, consisting of leaves only partially separated from the stalks, held together by some clammy substance, pressed in the form of cakes, and dried in the ovens. In using it, some pieces are broken off, reduced to powder, and then boiled with water or milk, meal, and fat. The soldiers on the northern frontier of China are paid in

brick tea, and in Tartary it is the usual medium of exchange.

Now let us look a little at the consumption and produce of tea. It was first brought to Europe by the Dutch, in 1610. A small quantity came to England in 1650. It is first publicly noticed in an act of parliament of the year 1660, in which it is enumerated as one of the beverages sold in coffee-houses, and a duty of eightpence per gallon was laid on the liquor made and sold from it. In the Journal of Pepys, then secretary to the Admiralty, he says : "Sept. 25, 1661. I sent for a cup of tea, (a China drink,) of which I had never drunk before." In 1664, the British East India Company sent two pounds of tea as a present to the king. Two years later, a quantity was imported from Holland by lord Arlington and lord Ossory, at which time it was sold for sixty shillings per pound. In 1667, the East India Company issued their first order to import tea, directing their agent at Bantam to send home 100 pounds of the best he could get. Since that time the consumption has steadily increased. In 1734, the quantity imported was 632,000 pounds ; in 1768, it was nearly 7,000,000 pounds ; in 1812, 20,000,000 pounds ; and during the last four years of the East India Company's charter, it averaged 31,500,000 pounds. Since the abolition of the monopoly, and the consequent reduction in price, the consumption has received a powerful impulse, and the importation of 1847 was

55,624,946 pounds. It has been calculated that the consumption of tea in England is equal to a pound and a half per annum for each individual; but in China it must be much greater in proportion, for there every one, who can, drinks tea at every meal—three, six, or even ten times in the day. Tea, too, is much cheaper there than in England, the average price being one-fourth of a piastre per pound in Canton, equal to about tenpence English. If, then, the consumption be only at the same rate as in England, 450,000,000 pounds, at least, are annually consumed in that empire alone. How vast the quantity of fresh leaves, the extent of plantations, and the number of hands necessarily engaged in the culture and manufacture of this enormous bulk of the one article—tea!

But ere we leave China, we must briefly notice rice, which, with tea and cotton, form the three most important products of the east. Rice probably supports more persons than any other kind of grain. It is a native of South America, as on the Rio Negro and in Para; also of Ethiopia, and probably of Asia. It is most generally cultivated in the east and south parts of Asia, where it forms the staple article of food; and, to a great extent, it is similarly employed in the north of Africa, Egypt, Nubia, Persia, Arabia, Asia Minor, Greece, Italy, and especially in the Southern States of North America, the West Indies, Venezuela, and the Brazils. In India and China, where rice is the chief food,

famine is the inevitable consequence of a failure of the crop, and this is not unfrequent, either from too much or too little rain, or from insects. In China, the land no longer produces sufficient food for the excessive population, notwithstanding all the industry with which agriculture is carried on; and this country, therefore, consumes all the superfluous produce of the fertile islands of the Indian Archipelago. But when the rice crop fails in China, the greatest fleets could hardly bring so much of the grain as would be required to prevent a famine. The Chinese government, therefore, adopts the same wise and benevolent policy which Joseph recommended to Pharaoh. Public granaries are established in each province, under the control of certain officers, whose duty it is, during a time of plenty, to purchase, at the cost of government, large supplies of rice, to be distributed to the poor at such prices as circumstances may require. If the grain of the following year should amount to an average crop, the stock on hand is sold at a price a little lower than the first cost; if the supply should be considerably short of the demand, it is then sold to the poor at reduced prices; but if the famine should be severe, it is then supplied to the sufferers gratuitously.

There are two varieties of rice: the mountain rice, which grows on hills; the other in marshy or very wet places. The common, or marsh rice, is generally sown in hollows prepared for it, two or three feet deep, and which

can be filled with water. In the south of China, these rice grounds occupy the whole of the level ground, and much of the sides of the mountains. In the latter case, they are either supplied with water by the streams which descend the mountain sides, or water is pumped from a field to the one lying above it, and in this way the water is often carried one thousand feet high. When the young plants are two or three inches high the tops are broken off, that each plant may form several shoots. In some parts of China, each plant is transplanted two or three times, in order to obtain a more abundant crop. The harvest commences three or four months after the transplanting; the ears are either cut closely off, and the stalks left to decay, or they are cut with the stalk, and bound into small sheaves. The average produce of marsh rice is from one hundred to one hundred and twenty fold.

A great variety of plants, of very peculiar character, and strikingly different from any which we are accustomed to see, distinguish this zone in South Australia. We will notice just a few; to do more would occupy too much space, while a mere enumeration of the scientific names would convey no information. So strange is the character of the vegetation of this country, that at first it would seem as if it belonged to a different world. Evergreens, of a dark melancholy hue, prevail; and there are whole shadowless forests of trees, with leaf stalks, but no leaves. The leaf stalks, dilated

and set edge-wise on the stem, supply the place of leaves in providing nourishment for the tree. They have a most singular appearance. The beautiful shrubby tribe of proteas, of which there are six hundred and fifty known species, abound in Australia, and nearly half of this number grow in the latitude of 33° or 34° . The myrtle tribe abound here, with splendid blossoms—white, purple, yellow, and crimson. Of one genus of this tribe, *Eucalyptus*, or gum tree, one hundred species, most of them large trees, grow in this country, some two hundred feet high, with straight trunks, rising to the height of one hundred or one hundred and fifty feet without branching, and resembling an assemblage of elegant columns, so irregularly placed as to intercept the view at the distance of a few hundred yards. They are elegantly crowned with branching tops of light willow-like foliage. Some of what are called “stringy bark gum trees,” rise nearly as high as the Monument without branching.

A gigantic nettle, *Urtica gigas*, is a tree with trunks eighteen, twenty, or even twenty-one feet in circumference; the leaves are heart-shaped, and six inches across; the sting is as painful as that of a wasp. The Moreton Bay chesnut, *Catanospermum Australis*, is a fine tree, with a profusion of flame-coloured blossoms, and leaves like those of the walnut. *Doryanthes excelsa*, a splendid plant of the lily tribe, twenty-four feet high, has brilliant crimson blossoms, and stems as thick as a man’s arm, which are

roasted and eaten by the natives. Leafless acacias, of which there are ninety-three species, and the *Epacris*, a beautiful tribe resembling the heaths, and containing three hundred and twenty species, with scarlet, rose, and white blossoms, form conspicuous features in the vegetation. The *Epacridæ* are almost confined to Australia and Polynsia. Only a single species of heath is found throughout Australia. Some species of fig which grow here are very remarkable. It sometimes happens, that when the seeds of these fig trees are deposited by birds in the cavities of other trees, as the eucalyptus, etc., at elevations of perhaps fifty feet, or more, they vegetate, and send down roots to the ground. These adhere to the tree in their course, and branching, unite with other roots of a similar kind. These thicken, spread, and again interlace, till at length the foster tree is completely encased, and its top is only visible, rising from among the branches of the fig, at the height of seventy or eighty feet.

In middle Australia, various *parasitic orchideaceæ* adorn the branches of the forest trees, and numerous climbing plants, with stems varying from the thickness of a pack-thread to that of a man's body, ascend into their tops, and send down their branches in graceful festoons. Two species of passion flower, one of jasmine, three of cissus, (a vine-like plant, with grapes the size of sloes,) various ipomæas, with lovely large flowers of pink, blue, white, and

yellow tints ; species of pepper, running up the trees like ivy ; and beautiful tecomas, (or trumpet flower,) with brilliant white flowers, tinged with rose—were a few of the rich variety observed by Mr. Backhouse in these forests. A cabbage palm (*Corypha Australis*) abounds. In South Australia, the grass-tree (*Kingia Australis*) rises solitary on the sandy plains, with bare blackened trunks, as if scathed by lightning, occasioned by the fires of the natives, and with long tufts of grassy leaves at their extremities. *Xanthorrhoea hastilis* (also called the grass-tree) is a very singular tree in its appearance, but furnishes very valuable fodder for all kinds of cattle, and the tender inner leaves are not to be despised by the hungry as human food ; they are far from disagreeable, having a milky taste, with a slight balsamic flavour. But we must not omit to mention the numerous ferns, which form a most marked feature in the Australian flora, and which are of all sizes, from the small and delicate frond to the magnificently beautiful tree ferns, with their feathery fronds thirteen feet long. Some of them climb the trees like ivy, some crowd the trunks of the largest forest trees, some cover the ground, and some are splendid tree ferns, with fronds from six to thirteen feet long, and trunks varying from three to thirty feet in height. *Acrostichum grande*, one of the ferns that grow on the trees, is as large as a full-grown Scotch cabbage, and is remarkably beautiful. The elk's horn fern (*Acrostichum alaicorne*) grows in thick, dense

masses, encircling the trunks of the trees. It retains much moisture in its dead, sterile fronds, which form large scales, rising one over another; it generally grows on the upper portions of the trunks of the *Casuarinæ*, (called "oaks" in Australia,) and in stormy weather they are sometimes thrown down by the weight of water and vegetable matter thus accumulated above them. Not the least remarkable circumstance in Australian vegetation is, that scarce any edible fruits, grain, or vegetables, have as yet been found native there.

The flora of South Africa differs very remarkably from that of most other parts of our globe, but most resembles that of Australia. The soil is sometimes gravelly, sometimes sand and clay, and stretches to an unknown distance into the interior. During the summer it is dry and parched, many even of the rivers disappear, and but few plants are seen, except succulent-leaved mesembryanthemums, etc., and stunted nimosas. The effect of rain is, however, like magic; in a short time, the ground is covered with a vast variety of beautiful plants, great numbers of which are peculiar to the district. Twelve thousand species of plants have been collected in the colony of the Cape of Good Hope, among which heaths, proteas, geraniums, and everlasting flowers, hold a conspicuous place.

"Gay plants on every side
Unclose their lovely blooms,
And scatter far and wide
Their ravishing perfumes."

Out of 553 species of heaths which are known, 533 inhabit the Cape colony, and are peculiar to it, only twenty species being scattered over the rest of the world. Of these England has six species, Mauritius three, Australia one, Portugal three, middle Europe two, South Europe five, Sicily one, Greece two, Arabia one, Corsica and Italy one, and two are found all over Europe. At the Cape—the head-quarters of this beautiful tribe—they revel in the greatest luxuriance, and seem to call the colony their own; their height far surpasses any known in England, a person on horseback being often overshadowed by them; and as gems of beauty they cannot be exceeded. Two hundred species of protea have also been collected here, one of the most splendid of which (*Protea cynaroides*) has a flower the size of a man's hat. Not one, however, of these two genera is to be found north of the mountains which bound the great Karroo, and most grow within one hundred miles of Cape Town; indeed, so local are they, that at the Cape the prevailing proteas are quite different from those forty miles off. In the sandy portions of the northern part of the country are found *Stapelias*, succulent plants, with leafless stems, and flowers the shape of starfish, which emit a scent so exactly like putrid flesh, that flies will often settle upon them in mistake.

Large portions of South Africa, both on the east and west, are covered with extensive thickets of thorny shrubs, called by the natives

“the bush,” much of which is composed of various mimosas and acacias. One of these, from its numerous hooked thorns, *Acacia detinens*, is called by the natives “stop-a-while ;” and with good reason, for no sooner is the passenger disengaged from one hook, than he finds that several others have caught hold of his clothes, and he may think himself well off if they are not torn to rags ere he is extricated. Another, *Acacia giraffæ*, is one of the finest timber trees of the country ; it is of very slow growth, and attains a large size, reaching the height of seventy feet. The wood, when dried for years, sinks in the water like lead. But this, and many others of the large trees, are much rarer in many parts of the country than formerly, multitudes having been destroyed by the natives for various purposes. Whole forests have become thus annihilated, and the consequence has been, a gradual diminution of the amount of rain, producing a long succession of dry seasons, the failure of the fountains and springs, and drought and desolation instead of the verdure of the forest. Among the thickets grow various species of aloe in great abundance, all with fleshy leaves, and some very beautiful. *Aloe spicata*, a plant three or four feet high, with a spike of bell-shaped white flowers, yields the Cape aloes, which are much used in medicine ; this drug is the juice of the plant evaporated to dryness. The great arborescent aloe, with red flowers, is a very conspicuous plant. *Aloe dichotoma*, which, in

our hot-houses, reaches a considerable size, is said to attain a circumference of three hundred or four hundred feet at the Cape, and yet the soil is nowhere drier than in those places where the aloes are found. Great succulent prickly euphorbias also abound here, some of which grow into trees forty feet high.

Plants of the genera *Cycas* and *Zamia* are found frequenting the West Indies, Japan, and Madagascar. They most resemble palms, with very short stems, though one which grows on the west coast of Australia is thirty feet high. Some of these yield a kind of arrow-root and sago; the sago produced from *Cycas revoluta* is said to be held in the highest esteem; soldiers are able to exist for a long time on a very small quantity of it, and the laws of Japan forbid the removal of the plants from the country. The trunks of species of this tribe have been found in considerable numbers near the Isle of Portland, in our own country, in a fossil state, apparently indicating a time when the climate of England was of a far more tropical character than at present. Many other facts point to a similar conclusion.* South Africa is the country of geraniums, by far the larger part of the tribe being found here. Five species of geranium, three of *Erodium*, and two hundred and eighty-seven species of *Pelargonium* inhabit the Cape, and fill the air with their perfume.

To the genus *Pelargonium* belong almost all

* Not one species of palm is indigenous to the colony.

the beautiful and favourite "geraniums" of our gardens, green-houses, and cottage windows. Ninety-four beautiful species of *Oxalis*, or wood-sorrel; *ixias* innumerable, a lovely tribe of bulbous-rooted plants; one hundred and fifty-three species of the house-leek and stone-crop tribe, all fleshy, attached to the soil by a strong wiry root, and nourished more or less from the atmosphere, are among the rich vegetation of the Cape. Many of the succulent plants are found in the driest situations, where not a blade of grass nor a particle of moss can grow—on naked rocks, old walls, sandy hot plains, alternately exposed to the heaviest dews of night, and the fiercest rays of a noonday's sun. Soil is to them something to keep them stationary, rather than a source of nutriment. So tenacious are they of life, that even when gathered, and between the drying paper of the botanical collector, under a heavy pressure, and having been exposed to heat, if possible to kill them, they have been known not only to live, but even to push out long shoots, and if in flower, for the process of fructification to proceed as if growing in the soil. Three hundred and twenty-six species of the succulent tribe of *mesembryanthemums*, called fig marigolds and ice plants, are found here, many of which have star-like flowers of dazzling beauty, and of every tint of white, yellow, purple, rose-colour, brown, flesh-coloured, red, crimson and scarlet. Many another tribe, equally showy and brilliant, though less known, adorns the

wilds of South Africa, with a splendour unknown in our colder clime.

Among the most striking features of the Cape are the myrtle hedges, which grow to a great height around every inclosure; "their blooming beauty waving over the head of the passenger; they unite their fragrance with the odoriferous exhalations from the orange and lemon trees, so abundant in that clime." Sometimes these luxuriant hedges extend for one or two miles, separating gardens, orchards, and other cultivated grounds. Some of our countrymen, who have visited the Cape of Good Hope, have recorded, that on their first arrival there they have trodden with caution, lest they should destroy the bright and beautiful heaths, geraniums, ixias, etc., which lay in their path. When wandering into the country they have come home laden with the wild flowers of the land, and have wondered how the colonists could wholly neglect the peerless beauties around them, while they cultivated with the most sedulous attention the paler flowers of more northern regions, the tulips, primroses, hyacinths, etc., of Europe. Not one of the lovely heaths is admitted into the garden of a colonist; and our countrymen in like manner soon came to regard them as common bushes, and cherish the English plants, which now had attained to the value of exotics.

But rich as is the vegetation of South Africa, and beautiful as its plants are, there are vast tracts which are entirely desert, where

only a few mimosas mark the course of some scanty water-course, dried up in the hotter months. These vast deserts are termed the Karroo, and Mr. Campbell remarked to Mr. Moffat, after travelling several days across them, "Sir, it would require a good pair of spectacles to see a blade of grass in this world." The Karroo has been well described by one who lived near its borders, and has often trod its surface—

"A region of emptiness, howling and drear,
Which mankind hath abandon'd from famine and fear :
Which the snake and the lizard inhabit alone,
And the bat flitting forth from his old hollow stone :
Where herb, nor shrub, nor tree takes root,
Save poisonous thorns that pierce the foot,—
And the bitter melon, for food and drink,
Is the pilgrim's fare by the salt lake's brink ;—
A region of drought, where no river glides,
Nor rippling brook with osier'd sides,
Nor reedy pool, nor mossy fountain,
Nor shady tree, nor cloud-capp'd mountain,—
Are found, to refresh the aching eye ;
But the barren earth, and the burning sky,
And the blank horizon, round and round,
Without a living sight or sound,
Tell to the heart, in its pensive mood,
That this is nature's solitude."

In North America, the lovely magnolias, the elegant but poisonous kalmias, both so deservedly prized by florists, and various species of pine and oak, are some of the characteristic plants of this zone. On the Lower Mississippi there are vast forests of cypress ; species of laurel, walnuts, sassafras, willow, and poplar, also cover the banks in places. In the southern part of the United States, trees with shining broad leaves and splendid blossoms, such as the magnificent magnolias, and tulip trees often one

hundred and twenty feet high, are distinctive features. The long-leaved pitch pine, one of the most picturesque of trees, covers an arid soil on the coast of the Atlantic to the extent of sixty thousand square miles. In the prairies of the valley of the Mississippi, dahlias, and evening primroses (*Oenothera*) abound with species of knapweed, (*Centaurea*), wormwood, and milk-vetch, (*Astragalus*.) Seven species of pine are indigenous in California, some of which have measured two hundred and even three hundred feet in height, and eighty feet in circumference. Here, too, grow the beautiful flowering currant bushes, now become so general in our gardens, and so ornamental in spring, (*Ribes sanguineum*, and *R. aureum*), and hence, too, come some of the most beautiful annuals of our flower borders, as *Gilia tricolor*, *Clarkia pulchella*, *Bartonia aurea*, *Collinsia bicolor*, *Erysimum peroffskianum*, etc.

The tobacco plant (*Nicotiana tabacum*) is a native of this part of America, and of Persia. Three species only are cultivated for use, the above, and *N. macrophylla* and *rustica*. The practice of tobacco smoking was introduced by sir Walter Raleigh, about 1586. Its use, however, like that of coffee, encountered much opposition. Laws and severe penalties were enacted against it. The grand duke of Moscow forbade its entrance into his territory, under pain of the knout for the first offence, and death for the next. The emperor of the Turks, the king of Persia, and pope Urban viii., all

issued similar prohibitions. A hundred volumes were written against it, and even king James I. took up his pen to suppress it. He styles it, "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black stinking fume thereof most nearly resembling the horrible Stygian smoke of the pit that is bottomless." Notwithstanding all this opposition, however, smoking has spread not only among civilized but savage nations; and now, probably, there is no single product of the vegetable kingdom so universally used. The cultivation of tobacco for commerce is chiefly carried on from 23° to 40° N. lat., and mainly in Virginia and Maryland. It might be successfully cultivated in England, but this is prohibited in order to encourage our American trade. The importation into this country in 1848 was 34,481,798 pounds of manufactured tobacco, and 1,504,673 pounds of cigars and snuff. The high rate of duty upon them, 3s. per pound, is, however, a great temptation to smuggling, and it has been calculated that one-fourth of the quantity consumed in Britain, and three-fourths of that used in Ireland are contraband. This is, probably, an over estimate of the present state of the trade.

From Mexico we have received the splendid dahlia, brought here by lady Holland in 1804; but its splendour, as cultivated in our gardens, far exceeds that of the wild plant, the latter having only a single flower of a reddish colour,

and by no means of remarkable beauty. Here abound a variety of plants of singular form, commonly known to botanists under the names of *Agave*, *Furcræa*, and *Yucca*. One species of the latter (*Y. gloriosa*) is commonly known as Adam's needle; and one of the agaves (*A. Americana*) is the celebrated American aloe. Some of these plants are stemless, while others have stems of various height and size, some of them fairly deserving to be called gigantic.

The agaves are cultivated in Mexico to a very large extent for the sake of the sap, which is very plentiful, and which, after being drawn from a wound made in the flowering shoot just as it begins to rise, is fermented, and forms a liquor called "pulque," which is a very favourite beverage among the Mexicans. A good plant yields from eight to fifteen pints of pulque per day, during two or three months; and a very vigorous plant is said to yield seven gallons per day, and through a much longer period. It is singular that the plants grow on the very driest ground, which is often scarcely covered with soil. Pulque is said to have a remarkably disagreeable odour, resembling putrid flesh; but when once the repugnance to this smell is overcome, even foreigners prefer pulque to every other drink, for it is said to be very nutritious and refreshing. Some idea of the enormous quantity consumed may be formed from the fact, that, before the revolution, from a very small duty laid upon it, no less than £170,000 were paid yearly upon that

brought into the two towns of Mexico and La Puebla.

One species of agave, (*A. Americana*), commonly known as the great American aloe, is celebrated as flowering only once in a hundred years ; the fact is, that all the agaves and allied genera produce a flowering spike of large size, but seldom till they have arrived at a considerable age ; and it would seem as if in some species the strength of the plant was over-exerted to produce the enormous mass of flowers, for they seem to be then exhausted, and die soon after. The pulque-bearing agaves seldom flower till they are fifteen years old. The fibrous parts of the root are made into cordage, and of these tough ropes the rude suspension bridges of Mexico are constructed. In former times, the agave was extensively employed in making a kind of paper, which was so much used that, in the time of Montezuma, thousands seem to have been engaged in painting hieroglyphics on this material. Thus, as Humboldt says, " It may be used as a substitute for the hemp of Asia, the paper reed of Africa, and the vine of Europe." In the West Indies and the Cape of Good Hope, it is much employed for making hedges, which are most thoroughly impervious.

A botanist and traveller, Karwinski, gives a striking account of a plant of this kind, (*Furcraea longava*), which he discovered on the mountains of Oaxaca, in Mexico, at a height of nine or ten thousand feet. This giant of

flowers had a slender trunk, forty or fifty feet high, and from twelve to eighteen inches in diameter ; at the top of this began the great tuft of leaves, five and six feet long, from the centre of which rose a spike of numerous white flowers ; this spike of flowers was from thirty to forty feet long, and had on it probably twenty thousand blossoms. It was, therefore, from eighty to ninety feet in total height, and is supposed to be three hundred or four hundred years old.

But, if the *gigantie fureraa* is so imposing in size, the *yueeas* are no less attractive for their beautiful flowers, of which we cannot have a better idea than by imagining a tree of somewhat similar figure to the giant just described, but of far lower stature, and with a magnificent spike of tulip-like flowers, of the most vivid hues. The South American flora in this zone differs most remarkably from that of South Africa or Australia, though in the same latitudes. Seventy-six species of the beautiful *Calceolaria*, so many of which adorn our green-houses, and many species of *oxalis*, or wood sorrel, and *mimosa*, inhabit Brazil, Chili, etc. *Mimosa pudica*, a native of Brazil, is the celebrated sensitive plant, the leaves closing and falling on the slightest touch. Most of the *mimosas*, of which there are seventy-three species, possess the same property. *Myrtles*, *fuehsias*, which are covered with their lovely flowers all the year round, grow everywhere. Not one species of rose has been found in South America. But the most interesting

tribe is that generally known as the cactus, of which there are eight hundred species, not one of which is known as a native of either Europe, Asia, Africa, or Australia, though in many of these they have been introduced, and grow freely as naturalized plants, as for, instance, on Mount *Ætna*. One of the most splendid is the night-blowing cereus, (*Cereus grandiflorus*), the blossoms of which begin to expand about six or seven in the evening, and are fully blown by eleven o'clock, but by three or four in the morning they fade, and hang down quite decayed. There is scarcely a flower known of greater beauty than this. Its blossoms are nearly a foot in diameter; the outer petals are of a dark brown, the inner ones of a splendid yellow, which gradually shades off to the most brilliant white in the centre of the flower. When several of these magnificent flowers, therefore, are open at once upon a single plant, they seem like stars shining out in all their lustre, verifying the poet's declaration—

“Darkness shows us worlds of light,
We never see by day.”

Some of the species, forming the genus *Melocactus* are globular, furrowed and beset with spines, and in shape greatly resembling melons.

Another, *Cereus senilis*, is called the old man cactus; it is of an oblong shape, about three inches high, of a greyish colour, and covered with long hair-like bristles, like the grey head of an old man. It has a very singular appearance. The creeping cereus, (or “creap in

serious," as we have seen it spelt on a boat on the coast,) *Cereus flagelliformis*, so common in our green-houses and cottage-windows, is a native of South America, and of the deserts of Arabia. It is not, however, to be despised because it is common, for its flowers are very beautiful, and are produced in profusion, while the ease with which it may be trained on trellises renders it a desirable ornament. The fruits of several species of the cactus tribe are used as edibles, and are very grateful in hot countries. On Mount *Ætna* they are sold in considerable quantities, and some of the varieties are excellent. The fruit of one species (*Opuntia tuna*) is of the richest carmine hue, and its juice is employed at Naples as a water colour. But the most important use of this tribe is the production of cochineal, which is not strictly, however, a product of the plants, but an insect allied to our lady-birds, which lives and feeds on several species, chiefly on *Opuntia cochinellifera* and *O. tuna*. The cochineal cactuses are principally cultivated in Mexico, Brazil, and the West Indies, whence we receive our chief supply of cochineal. Attempts also have been made to introduce them into Teneriffe and Madeira, where they appear to succeed; but it seems probable that cochineal can be grown with advantage only where labour is very cheap. The quantity imported into England in 1848 was 2,058,560 pounds. On the table-lands of southern Peru, near the limit of vegetation, there are seen mounds, a foot or a foot and a

half high, of a reddish yellow colour, which are often mistaken at a distance for crouching deer; but when more closely examined the resemblance vanishes. These little mounds are formed of low cactus plants, the leaves of which are pressed close to each other, and covered with reddish yellow spines, two or three inches long, between which the flowers appear, but do not rise above them.

CHAPTER IV.

Warmer temperate zone—Orange—Vine—Varieties—Asia Minor—Benefits of commerce—Rose—Thibet—Prangos—United States—Maize—Chili—Araucaria—Primeval forests—New Zealand—Van Diemen's Land—The colder temperate zone—Oak—Corn—Comparison of this zone in the northern and southern hemispheres—Sub-arctic zone—Pine and Fir—Arctic zone—Polar zone.

THE *Warmer Temperate Zone* extends from 34° to 45° of latitude either north or south. This zone includes southern Europe, as far as the Pyrencees and the southern Alps, Italy, Spain, Portugal, the south of France, the isles of the Mediterranean, Turkey, and Greece. In Asia—Asia Minor, part of Syria, Armenia, the north of Persia, the south of Tartary, the north of Thibet, the northern part of the vast Chinese empire, and Japan. In North America—the northern part of the United States, the Missouri and Oregon territories. In South America—the south of Chili, and parts of La Plata and Patagonia: New Zealand, and Van Diemen's Land. The average mean temperature of these countries is between 53° and 62° Fahr. In the plains of Majorca, the carob tree (*Ceratonia siliqua*) and the olive grow luxuriantly. Many of the greatest favourites in our gardens and

grounds are natives of southern Europe, as anemonies, tulips, iris, asphodel, carnations, lavender, etc. In Spain, Portugal, and Sicily, tropical families appear in the oleander, myrtle, pomegranate, and olive. Cactuses, though not native, flourish luxuriantly. A gigantic grass (*Arundo donax*) rises to the height of twenty feet and upwards. The *Chamarops humilis* affords the most northerly specimen of the palm family, and the date palm may occasionally be seen, but only cultivated, and it does not produce fruit. This is, indeed, the northerly limit of the palms.

The banana is frequently found on the banks of the Guadalquiver, and the lime, the orange, the citron, and the lemon, grow abundantly, and perfume the air with their blossoms. They are generally supposed to be only naturalized in southern Europe, and that all are originally natives of Asia. The orange tree is one of great value, affording a fruit which is not only exceedingly grateful and wholesome, but one of such durability, that it can be kept for a considerable time with less alteration than any other fruit; its thick spongy rind, studded over the surface with innumerable oil receptacles, enabling it to resist both the changes of the atmosphere, and the evaporation of its juice. It is the only tropical fruit which can be imported into this country at so cheap a rate as to compare in price with our native ones, and thus, while affording a luxury to the poor, it is of so delicious a nature, that

it is not despised by the rich. From the amount of duty paid, it is calculated that 272,000,000 of oranges are annually imported into this country. 390,546 chests of oranges and lemons, besides a considerable number loose, and a still further quantity which were only entered by *value*, were imported in 1848. So prolific are the trees, that a single one in St. Michael's has been known to produce 20,000 oranges fit for packing, exclusive of damaged ones and waste, which may be calculated at a third more. The oranges intended for exportation are gathered green; if they were suffered to become ripe, they would spoil on the passage. The orange harvest commences with October, and ends with December, a period of about three months; to ripen on the tree, they would require to hang till the spring. It is a singular fact, that the trees from which the oranges are gathered green, bear plentifully every year, but if they hang till ripe, the tree only bears well every other year. Near Cordova, there are orange trees six or seven hundred years old; in Andalusia, there are extensive orchards, which formed the principal source of revenue to the monks for ages; and in the south and south-west of Italy, there are groves of oranges almost amounting to forests.

Spain and Portugal are the head-quarters of the *Cistus* tribe; no less than twenty-one species of *Cistus*, and eighty-three of *Helianthemum*, being found there. They are a beau-

tiful tribe of flowers, appearing in a wonderful suecession, which open every morning, and fall off before the close of the day. The gum eistus (*C. ladaniferus*) is a well-known and extremely beautiful species; it forms extensive groves in the south of Spain and Portugal, but is not found either in Italy or Greece. In the north of Italy, rice reaches its northern limit in Europe. It is cultivated near Milan, but the employment is so deleterious to the labourers engaged in it, that the government has prohibited its further extension. The Spanish chesnut abounds in the forests of the south of Europe; one on Mount Ætna has long been celebrated, and is said to be capable of sheltering a hundred horsemen under its boughs. The cabbage rose, the damask rose, the laurustinus, the laurel, (*Cerasus lauro-cerasus*), the Christmas rose, (*Helleborus niger*), the laburnum, the monkshood, the pæony, and the pyramidal bell-flower, (*Campanula pyramidalis*), so beautiful a pot plant—are all brought from Spain, Italy, and Turkey. The *Dictamnus albus* (or *Fraxinella*), found in this district also, abounds in volatile oil to such a degree, that the atmosphere surrounding it becomes inflammable in hot weather; and more singular still, if lighted, it will burn without injuring the plant. Passing into Armenia, we come into the native region of the vine. Parrot describes it as the queen of the forests in the woods of Mingreli and Imereti. The stem there attains

a thickness of from three to six inches, and it mounts to the top of the loftiest trees, festooning them, and binding them to each other.

The vine is generally a native in the countries lying between the Black and Caspian Seas; from whence it would seem to have found its way into Egypt, Greece, and Sicily; and from Sicily to Italy, Spain, France, and England. In the native countries of the vine there is no true culture of it, and yet there is such an abundance of excellent grapes, that even the poor peasant does not gather all that grow on his little patch of land, but leaves them over the winter, and often before Easter the grapes of the previous year are beaten off the trees. Very probably the native country of the vine extends far beyond the Caspian Sea towards India, and even the north of China. Humboldt estimates that it can flourish wherever the annual mean temperature is between 50° and 63° Fahr. In America, the most northerly limit of the vine appears to be the 40th parallel of latitude. In both hemispheres, it does not seem to flourish nearer the equator than 30° , except in elevated situations, where the altitude compensates for the latitude. In Europe, its northern limit varies; it reaches further north in the interior than on the western coast. In the west of France it reaches to 49° N. lat.; in England it ripens plenteously only in favourable years; at Berlin, 53° N. lat.; and at Dantzic, $54^{\circ} 21'$ N. lat., it is freely cultivated. It has even been carried

above Königsberg, $54^{\circ} 42'$ N. lat. It therefore occupies a band of about 20° in breadth in the old world, and about 10° in the new.

In Egypt, its culture appears to have been carried on from the earliest dates, as we learn from Scripture, (Gen. xl. 9—11.) It was never, however, grown to a great extent, as the soil is unfavourable; the grapes produced are small, and wine was never, as it is in south Europe, the common drink of the people, who used beer from a time only inferior to the culture of the vine. The growth of the vine in Palestine, and the preparation of wine from it, may be traced to a very high antiquity. Immediately after the Deluge, Noah planted a vineyard, and drank of the wine even to intoxication, (Gen. ix. 20.) Vines were enumerated by Moses as among the riches of the promised land, (Deut. viii. 8;) and the spies who were sent to search the land, cut down so large a bunch of grapes in Esheol, that they carried it suspended on a pole between two of them, (Num. xiii. 23;) the size and luxuriance of which doubtless astonished the Jews, who had been accustomed to see only the small grapes of Egypt. Similar bunches, we are assured by travellers, have been gathered in Hebron in modern days. Very numerous are the Scripture references to the vine, which we have not space to detail.

The vineyards, among the Jews, were generally situated on the south side of a hill, or mountain, which was often cut into terraces for

the purpose. The vintage was a season of great rejoicing. Very often the vine was, and is still, trained over a verandah of trellis-work, which is often fixed by the side of a well, inviting the owner and his family to gather beneath its grateful shade. This beautifully illustrates the "fruitful bough by a well," Gen. xlix. 22, the emblem of the rich blessings which were promised to Joseph and his descendants; and that delightful representation of the effects of the gospel on the hearts of men, producing universal peace, when every man shall sit "under his vine and under his fig tree; and none shall make them afraid," Micah iv. 4. The Phœceans first carried the vine into the south of France; the Romans planted it on the banks of the Rhine.

It is indubitable, that formerly there were many and extensive vineyards in this country;* they are mentioned in the earliest Saxon charters, as well as in Domesday Book. William of Malmesbury, who flourished in the twelfth century, mentions a sweet and palatable wine, little inferior to that of France, which was made in abundance in the vale of Gloucester. It is stated that, at Arundel Castle, in Sussex, the duke of Norfolk had a vineyard, of which there were in his grace's cellar, in 1763, about sixty pipes of excellent Burgundy. About the same time, the hon. Charles Hamilton, of

* There is evidence to prove that there were some in the year A.D. 280, and Bede, writing in 731, speaks of vineyards growing in several places.

Painshill, had a vineyard which succeeded for many years, and produced excellent champagne. In many countries, as in Persia, Crete, Mingrelia, etc., the attempt is made to keep the grapes on the vines fresh throughout the greater part of the year, which is, perhaps, possible in those countries on account of the great dryness of the winter. A vineyard, associated as it is with our ideas of beauty and plenty, generally disappoints the traveller. A hop garden in Kent is a far more picturesque object. In France and Spain the vine is seldom allowed to grow above three or four feet high. But in Italy is found the true vine of poetry, surrounding the stone cottage with its girdle, flinging its pliant and luxuriant branches over the rustic verandah, and twining its long garland from tree to tree. The number of varieties of the vine is extraordinary; but the most remarkable fact is, that the same variety of vine often produces two different kinds of wine, even in places lying close to each other. These differences are, indeed, inexplicable to us; we only are sure that they must be caused by the locality, but how, we know not. In the catalogue of the Luxemburg Garden, at Paris, fourteen hundred varieties are enumerated; about six hundred are cultivated in the gardens of Geneva; sixty-four varieties are grown in English gardens; one hundred and nineteen in Spain; and forty-one in the regions of the Rhine.

It is a remarkable fact, and well worthy of

our attentive notice, that many of those plants most valuable to man are precisely those most disposed to run into varieties. This is remarkably the case in one of the most useful fruits of the temperate zone, the apple, of which Mr. G. Don enumerates fourteen hundred varieties cultivated in gardens ; and the benevolent intent of such an arrangement is at once seen, in the great extension given to the usefulness of the plant. The wild apple, or crab, is a harsh, sour fruit, but from it, by cultivation, this vast diversity has been developed, affording a combination of qualities suited to a variety of uses, and thus making it most extensively applicable as an article of food and luxury. The same author gives six hundred and seventy-seven varieties of the pear, two hundred and seventy-four of the plum, sixty of the nectarine, and nineteen of the orange. One hundred and sixty varieties of rice are known in Ceylon alone. It seems difficult to believe that the red cabbage, cauliflower, savoy, Brussels' sprouts, and white cabbage, have all sprung from the *Brassica oleracea*, as found on our shores, with its sea-green leaves, no appearance of a head, and flowers like charlock—yet such is the case. The rose, again, sports into fourteen hundred varieties, and many of our favourite garden flowers, which delight equally the sight and smell, are similarly disposed. How bountiful and kind a provision is thus made by our heavenly Father, to minister to the wants, comforts, and pleasures of his crea-

tures ! How true that, though we have sinned and rebelled against him, he is long-suffering and full of compassion, and that "his tender mercies are over all his works !" But to return. Immense quantities of grapes are dried in various countries, and made into raisins, of which no less than 240,042 cwt. were imported into England in 1848. The "currants" of our grocers' shops are the dried grapes of another variety of vine, (the black corinth,) grown chiefly in the Ionian Islands, 402,306 cwts. were imported in 1848.

We owe many of our best fruits and sweetest flowers to that part of Asia which lies beneath the warmer temperate zone. In the fruitful valleys of Armenia, south of the chain of Caucasus, are found whole thickets of lemon, pomegranate, pear, and cherry trees. Every species of fruit cultivated in our gardens grows there apparently wild; but whether they are to be considered as truly natives of the soil, or as being the remains of very ancient gardens, is the more difficult to determine, as this is just the very spot which appears to have been first peopled by the descendants of Noah. The concurring testimony of both sacred and profane history leaves us no room to doubt that, from this region, as from a centre, arts and civilization were carried to the other regions of the earth, and among them, probably, the art of gardening; for, though we are unacquainted with the original birthplace of most of our cultivated plants, history informs us, that some of the most

valuable productions of our gardens were first brought into Europe from that fruitful region between the Euphrates and the Indus, the Caspian Sea and the Persian Gulf. It would be both pleasing and instructive to pursue this subject, but a hint or two must suffice.

The conquests of the Romans first made them acquainted with the fruits of the east, and then they spread them wherever they directed their victorious arms. They derived the fig from Syria, the orange and citron from Media, the peach from Persia, the apricot from Epirus, the pomegranate from Africa, the plum, the cherry, and the pear, from Armenia. A cherry tree, laden with fruit, adorned the triumph of Lucullus, which he had brought from Pontus, as a memorial of his conquest of that province—a sight till then unknown to the inhabitants of Italy. In less than a century, the same species of cherry was common in France, Germany, and England, where the conquerors had introduced it. Whatever are the evils of war and conquest—and they are very fearful—they yet contributed, in the early stages of society, to diffuse the knowledge of many an article, and custom, and art, which have tended powerfully to promote the advance of civilization. The attachment which the monks manifested to gardening, during what are called the dark ages, may be regarded as another cause of the diffusion of foreign fruits throughout Europe. In our own country, and, doubtless, in many other portions

of the continent, before and long after the conquest, the monks appear to have been the only gardeners ; and many an abbey garden yet remains, though in ruins, to attest that the monks, with all their faults, were men of peace and study, and were doing much to improve the world, while the warriors were spending their lives to despoil it.

It was by the labours of missionaries that European vegetables were introduced into South America, from one end of the continent to the other ; and the same course is now pursued by our missionaries in the South Seas and in South Africa. Lastly, commerce has very largely contributed to the comforts and welfare of man, by gathering around his dwelling those fruits which have been scattered by Providence over the most distant parts of the globe. For nearly a century and a half this country has, by means of her widening commerce, steadily proceeded in collecting from every clime and country the fruits and flowers indigenous to each ; and has thus provided, even for the poorer classes, comforts and luxuries once unknown even to the wealthy of the land ; while it has improved our tastes, and extended our resources as a nation, to a degree which would formerly have been considered impossible. To the same commerce we owe the potatoe and the pine-apple ; the China rose, whose flowers cluster around the cottage porch, and the camellia, which adorns the conservatory ; the tea, coffee, and sugar, which are now necessities of life, and the

cotton, which is the staple of our manufactures. But to return from this digression.

The moss rose, the damask rose, the cabbage rose, and the French rose, which are universal favourites, are all inhabitants of Persia and Asia Minor, where they abound, and are highly esteemed. "The delight of the east, the theme of the poet in all ages, the praises of the rose have been sung in the language of every nation where it is known. All virtue, all loveliness, has been characterized by it; from the solemn personification of Scripture of Him whom 'the preacher' called 'the Rose of Sharon,' down to the simile of the humblest minstrel that ever touched the harp of poesy." We might have expected that all Asia, between 30° and 50° lat., would have enjoyed a mild climate; such, however, is far from being the case, on account of the structure of the continent, which has the highest table-lands and the lowest plains on the globe. The table-land of Thibet, which is not cultivated, is very sterile, and has a most unpropitious climate: frost, snow, and sleet, beginning early in September, and continuing, with little interruption, until May: snow, indeed, falls every month in the year. The air is always dry, because in winter moisture falls as snow, and in summer is quickly evaporated by the intense heat. The thermometer sometimes rises to 144° in the sun; and even in the winter his direct rays have great power for an hour or two, so that a variation of 100° has occurred in the twenty-four hours.

The most common plants are a species of furze, prickly shrubs, rhubarb, various species of gooseberry and currant, hyssop, rose, assafœtida, etc. Three species of wheat, three of barley, and two of buck-wheat, are natives of the lofty table-land, but European grain and fruits can only be cultivated here and there, in sheltered spots. Here, also, grows the *Prangos pabularia*, an umbelliferous plant, with scented blossoms, of vast value as fodder for sheep. It is capable of flourishing on the most inferior lands, unfit for anything else, and is so nutritious, that sheep will become fat on it in twenty days. Another valuable property it possesses is, that it is fatal to the liver-fluke, (*Fasciola hepatica*), which, in England, after a wet autumn, destroys some thousands of sheep by the rot, a disease which has hitherto proved incurable. It is very hardy, most abundant in its produce, and promises, at no distant day, to be one of the most valuable kinds of winter fodder ever brought into cultivation.

In Japan, and the eastern countries of Asia, figs, oranges, pomegranates, wheat, oats, rice, etc., are exceedingly productive. Here, too, Asiatic species of buckthorn and honeysuckle are so numerous, as to give a peculiar character to the vegetation. Intermixed with these, and with roses, are thickets of azaleas, of dazzling brightness and beauty. In the United States, several magnolias, the beautiful tulip tree, (*Liriodendron*), and a number of noble species of the mimosa tribe, occur in this zone, one of

which, *Robinia pseudacacia*, is very commonly cultivated in this country, and is known by the name of thorn acacia. It is a very fast growing tree, and, when in blossom, is very elegant, with its abundant bunches of white sweet-scented blossoms, resembling those of the laburnum, except in colour. It is highly valued in America for its timber, which is very durable, and is often employed in ship-building, being considered scarcely inferior in any respect to English oak. Another species, (*Robinia hispida*), is an exceedingly ornamental plant in shrubberies, growing from three to six feet high, and with beautiful clusters of large rose-coloured blossoms.

In the forests of the Missouri, above St. Louis, appear thorny roses, which ascend to the top of the highest trees, and adorn them with countless red flowers. The autumnal tints of the forests in the middle States are beautiful, and of endless variety; the dark leaves of the evergreen pine, the red foliage of the maple, the yellow beech, the scarlet oak, and the purple nyssa, with all their intermediate tints, ever changing with the light and distance, produce an effect at sunset that would astonish the native of a country with a more sober coloured flora, under a more cloudy sky. Kalnias, hydrangeas, rhododendrons, and azaleas, with a large variety of timber trees, many of which are little known in this country, are some of the most interesting plants of the United States flora, which is nearly twice as rich in species as that of Britain.

Maize, or Indian corn, is the only grain indigenous to America, and it is a native there only. Before the arrival of Europeans, it was the chief corn plant of the new world, and, in some parts, (the tropical ones especially) is so still. It thrives best in the hottest and dampest tropical climates, where it sometimes brings forth eight hundred-fold, and in less fertile lands three hundred to four hundred-fold. It will not succeed in America higher than 40° N. lat., though in Europe it reaches $45\frac{1}{2}^{\circ}$ on the west coast, on the Rhine 49° , and in Prussia 52° . From the low mean heat of the summer in England, it is evident its cultivation will not succeed in this country, although it may occasionally ripen; it will, however, be in the recollection of many, that the late William Cobbett was very enthusiastic for its general culture in our land. In Asia, maize is extensively cultivated, especially in India, China, Japan, Sumatra, and the Phillippine Islands, having been, no doubt, introduced from America, but in what way is not known. So generally is it used in Mexico, that at the beginning of this century, above 1,600,000,000 pounds were consumed by a population of not more than 5,000,000, equal to 320 pounds a year for each person. A considerable quantity is consumed in this country. In 1847, 3,608,312 quarters were imported, besides 1,448,837 cwts. of Indian corn meal, though this was larger than usual on account of the distress in Ireland. An ardent spirit, resembling brandy, is obtained from the juice of the stalks.

In Chili and Patagonia, an elegant and tall tree of the pine tribe (*Araucaria imbricata*) forms extensive forests, and produces cones the size of a child's head, which supply the natives with a great part of their food. It is said that the fruit of one large tree will maintain eighteen persons for a year. A very remarkable circumstance attends the burning down of such primeval forests, a circumstance which not unfrequently takes place in these and other parts of America on both sides of the equator. The same kind of trees as those which formed the original forest never re-appear, but some other species, which had previously been strange to the spot, spring up instead of them. Thus, in Patagonia, if one of these pine forests be burned, the ground on which it grew is soon covered with an impenetrable brushwood of other plants. In Chili, the violently stinging, but beautiful climbing loasa, appears first in these burned places, bushes grow afterwards, and then comes a tree grass, eighteen feet high, of which the Indians make their nets. In Pennsylvania, when the ancient forests are burned, they are succeeded by a thick underwood of rhododendrons. In each of these instances, the primitive forest had no undergrowth, and in each, also, the kind of plant which appears as a successor is constant, according to the character of the forest destroyed, and the country where situate. A somewhat similar circumstance occurred in this country after the great fire in London, in 1666; a great quantity of *Sisym-*

brium irio, or London rocket, sprang up all over the ruins, though previously it was a very rare plant, and is so now.

In New Zealand, many singular and elegant plants are found. Noble trees form immense forests, sixty of which yield timber of the finest quality, and many are of kinds to which we have nothing similar. Oaks, birches, and willows, are entirely absent; but there are some species of the fir tribe and beech peculiar to the country. The New Zealand flax (*Phormium tenax*) is found abundantly on the mountains and plains, and great quantities are exported to this country, where it is much used, especially for twine, its fibre being stronger than that of ordinary flax. One hundred and forty species of ferns, and a species of fuchsia, together with a *metrosideros* with crimson blossoms, adorn the country. This latter grows to a very great size, and sends shoots from its trunk and branches to the ground, which become so massive that they support the old stem, which seems to die; it is, in fact, an enormous epiphyte, growing to, instead of from the ground.

In Van Diemen's Land, eucalyptus trees of enormous dimensions abound, as in Australia, but of still greater height, many towering to a height much exceeding that of the Monument. One prostrate tree was measured, which was two hundred feet to the first branch, a second cut into rails was one hundred and eighty feet long, a third was so large that it could not be cut into lengths

for splitting. When the Emeu Bay forest was surveyed, one aere was found to contain 2,384 trees, and another 1,976. Many of these trees are forty, fifty, or fifty-five feet in circumference. Of one of these, fifty-five and a half feet round, Mr. Baekhouse says : " My companions spoke to each other when at the opposite side of the tree to myself, and their voices sounded so distant, that I concluded they had inadvertently left me to see some other object, and immediately called to them. They, in reply, remarked the distant sound of my voice, and asked if I were behind the tree ! When the road through this forest was forming, a man, who had only about two hundred yards to go from one company of the work-people to another, lost himself ; he called, and was repeatedly answered, but getting further astray, his voice became more indistinct till it ceased to be heard, and he perished." Tree ferns grow here in all their glory, most beautiful with their princely crests of fronds, many of which are thirteen feet in length. *Acacias*, *epaeris*, *bank-sias*, grass trees, and *asters*, are abundant, and show its close affinity with the vegetation of Australia.

5. *The Colder Temperate Zone* includes that portion of both hemispheres which lies between 45° and 58° . This zone embraces the British Isles, France, Belgium, Holland, Switzerland, Prussia, Austria, Germany, Denmark, and southern Russia ; in Asia—northern Tartary, Mongolia, southern Siberia, and Kamsehatka ;

in America—part of Columbia, Newfoundland, and the British territory; the south of Patagonia, Terra del Fuego, and the Falkland Islands. The mean annual temperature is between 42° and 53° . Deciduous trees are a characteristic feature of this zone in Europe, as evergreen ones were of the last. The chief forests are composed of oak, elm, beech, pine, fir, lime, etc., while willows of many species abound in the moist and marshy lands. The oak is found as far north as 63° at Drontheim, in Norway; on the confines of Asia it ceases to grow at $57\frac{1}{2}^{\circ}$ lat., and on the east of Asia it has its northern limits on the banks of the Argoun $51\frac{1}{2}^{\circ}$ N. lat., eight hundred miles nearer to the equator than its limits in western Europe.

The oak is the most valuable timber tree of this zone for strength, durability, and general usefulness. One, which was felled in 1810 for the use of the navy, contained 2,426 cubic feet of sound and convertible timber. The bark was estimated at six tons; five men were employed twenty days in cutting down and shipping it, and two sawyers were engaged for five months in cutting it up. The whole produce of the tree when brought to market was nearly £600. It will not flourish in tropical climates. Bishop Heber mentions that, in the Botanic Garden at Calcutta, he saw what excited a melancholy kind of interest—a little wretched oak, kept alive with difficulty under a sky and in a temperature so perpetually stimulating, that no

time was allowed it to shed its leaves, or recruit its powers by hybernation.

We have not space now to enter into details respecting our other forest trees ; we may just state, that the birch ceases on the coast of Norway at 71° ; the beech at 58° : the sycamore and the ash at 63° ; the lime occurs in Russia at 60° ; the elm and maple at 57° . This, too, is the region of our corn plants. Wheat does not succeed beyond 63° N. lat., and in Russia not beyond 60° ; in Kamschatka the limit is 51° . On the east of America, corn does not extend beyond 52° . Barley sometimes ripens in favourable summers as high as 70° in Norway. Nor does the cultivation of our corn plants succeed better in the torrid zone than in polar regions, except in elevated spots, where the heat is moderated by the altitude. We know nothing respecting the original place of growth of the cerealia; though there is every reason to believe that their cultivation is coeval with the existence of man upon the earth. Within the temperate zones their cultivation is all but universal, and in the more favourable situations, such as Egypt, etc., its produce is very great. Humboldt mentions wheat plants in Mexico which sent up forty, sixty, or seventy stalks, the ears of which were almost equally well filled, and contained one hundred to one hundred and twenty grains each.

Some of the distinguishing plants of this zone, in Europe, are the cruciform plants; such as the mustard, cress, wall-flower, stock, cab-

bage, turnip, sea-kale, candy-tuft, radish, etc. ; the umbelliferous tribe, as carrots, carraways, parsley, parsnip, celery, hemlock, etc. ; the *Caryophyllææ*, a class including the pink, carnation, lychnis, catchfly, chickweed, etc. ; the *Campanulas*, and a division of the composite plants, including endive, hawkweed, dandelion, sowthistle, and a great variety of plants of a similar structure. The extensive heaths already alluded to, covered with our common heath or ling, (*Calluna vulgaris*,) form a remarkable feature in the European part of this region. In that part of Asia which lies in the colder temperate zone, vast plains characterize it, called steppes ; these are generally barren tracts, often strongly impregnated with salt, and abounding in salt lakes and pools, with a stunted and scattered vegetation. Here and there are more fertile spots, where trees and food plants grow, but they are like the oases of the desert. Species of saltwort, (*Salsola*,) tamarisk, sea lavender, (*Statice*,) liquorice, vetches, and wormwood, are among the prevailing steppe plants.

In that portion of the southern hemisphere belonging to this zone, the southern part of Patagonia, the Falkland Isles, Terra del Fuego, Kerguelen's Land, and Prince Edward's Island, with a few other very small detached islands, are all the land. On these vegetation rapidly diminishes as they approximate to the antarctic circle ; and it is a well-ascertained fact, that the temperature decreases much more rapidly

from the equator towards the south pole than towards the north. Vegetation decreases as the latitude increases, till at length utter desolation reigns. This is partly owing to the want of heat in summer and more than to the greater cold in winter. In high northern latitudes, the power of the summer sun is so great as to melt the pitch between the planks of the vessels; while, in corresponding southern latitudes, the thermometer does not rise above 14° (18° below the freezing point) at noon, in a season corresponding to our August. Sandwich Land, in a latitude corresponding to the north of Scotland, is perpetually covered with many fathoms of snow. The south Shetland Isles have but one flowering plant, a grass, (*Aira antarctica*.) and are no less ice-bound than the last; while the Shetland Isles, in the north of Scotland, in an equally high latitude, are both inhabited and cultivated. South Georgia, in the same latitude as Yorkshire, but south, is always clad in frozen snow, and produces only a few lichens, mosses, and wild burnet; while Iceland, ten degrees nearer the pole in the northern hemisphere, has eight hundred and seventy species, more than half of which are flowering plants. But a few degrees makes a great difference in the southern hemisphere. Terra del Fuego, only six degrees nearer the equator than the frozen south Shetland, is clad with dense forests of winter's bark and beech. Species of arbutus, myrtle, barberry, eurrant, and fuehsia; and calceolarias,

violets, crowfoots, plants of the cruciform and pink tribes, thrift, and celery, are among the most conspicuous of the herbaceous plants.

It is singular that, in this distant island, there are a greater number of plants identical with those of the British isles than in any other country of the southern hemisphere: thirty three flowering plants, and forty-eight mosses, with nearly all the lichens, being common to both, though principally absent from the intermediate latitudes. On the Falkland Islands, though in a lower latitude, not a tree is to be seen, and the only large shrub, *Veronica elliptica*, is very rare. Two plants, however, are peculiar to these islands. One of these, the balsam bog, (*Bolax globaria*), is an umbelliferous plant, but of very peculiar habit. It grows in tufted and very firm hemispherical masses, of a yellow green colour, often four feet high, and as many in diameter; a strong-smelling resinous substance exudes from it, perceptible at a distance. The tussack grass (*Festuca flabellata*) is a still more singular plant, but yet the most useful in the islands. Each tussack is a separate plant, occupying about two square yards of ground. It forms a hillock of matted roots, rising straight and solitary out of the soil, often six feet high, and four or five in diameter, from the top of which issues a thick grassy foliage of blades, six feet long, drooping on all sides, and forming with the leaves of the adjacent plants an arch over the ground beneath it, which affords shelter to

sea lions, penguins, and petrels. Cattle are exceedingly fond of this grass, which yields annually a much greater supply of excellent fodder than the same extent of ground would do either of common grass or clover.

5. *The Sub-arctic Zone* stretches, from 58° lat. to the arctic circle, and its average mean temperature is between 39° and 42° Fahr., but this varies exceedingly in different localities. It embraces in the northern hemisphere, Norway, Sweden, Finland, the north of Russia, Iceland, part of Siberia, the more northerly portion of North America, and the south of Greenland; in the southern hemisphere, only a few barren and small islands extend into this zone. It is the region of the firs and willows; the beech, oak, and pine, or Scotch fir, will not flourish within it, or rather not beyond 60° N. lat., though on the western coast of Norway, under peculiar circumstances, the pine has been found as far as 70° N. lat. In the interior, the noble fir appears in its place. Prodigious forests of these are spread over the mountains of Norway and Sweden; and in European Russia alone, 200,000,000 acres are clothed with pines and firs alone, or occasionally mixed with willow, poplars, and alders. In very many places, on both the Swedish and Norwegian mountains, these forests are not accessible, and they are of value only when situated near a river, or an arm of the sea. The Gulf of Bothnia is surrounded by one vast, contiguous, unbroken forest, as old as the world, and con-

sisting chiefly of pines. From these countries we derive our best deal timber ; red (or yellow) deal, which is most valued, being the produce of the Scotch fir, (*Pinus sylvestris*;) the white deal comes from the spruce fir, (*Pinus abies*.) When the markets of the Baltic were closed during the war, an enterprising individual conceived the daring idea of turning the immense forests of pines on the mountains of Switzerland to the purposes of commerce. This he actually effected by contriving an immense trough, formed of 25,000 pine trees, six feet broad, and from three to six feet deep, and 44,000 English feet in length. Along this, constantly kept moist, the pines descended from the mountains into the lake of Lucerne, a distance of between eight and nine miles.

The larger pines, which were about one hundred feet long, ran through the space in about six minutes. The markets of the Baltic having been once more opened by the peace, the speculation was abandoned as unprofitable. Turpentine and tar are also two important products of the fir tribe. The former is the thick, glutinous sap, which is abundantly poured out when the trees are pierced near the ground. When distilled, spirits of turpentine come over, while the solid residuum is resin. 392,942 ewts. of turpentine were imported in 1848. Tar is procured by heating billets of the wood in a kind of rude oven ; the tar oozes out, and is collected in a reservoir below. The ancient

Greeks extracted their tar in precisely the same way as do the Bothnians at this day. 150,888 barrels of tar were imported in 1848, each barrel containing thirty-one and a half gallons. The climate and productions of Norway and Sweden cannot be taken, however, as a fair specimen of the vegetation of this zone; as, from their peninsular character, they enjoy a much warmer temperature than almost any other country within its limit. Even here, however, the apple ceases at $63\frac{1}{2}^{\circ}$, the cherry at 63° , and the pear at 62° . The vegetation of Iceland in the meadows and pastures is much the same as our own; there is, however, a total want of trees, for the birch and alder, though abundant, attain but a small height. Corn is cultivated to a very trifling extent, often not at all for a long series of years, for, towards the end of summer, the weather is so changeable that the grain seldom ripens. The sea pea (which we have already noticed) is used as an article of food, and they are said to be very well flavoured. The principal vegetables, such as cauliflower, potatoe, turnip, etc., succeed. Many of the sea-weeds are collected, and used as food. The Iceland moss (*Cetraria Islandica*) is also gathered for food; it grows in great quantities, and is collected from the same grounds every three years. The bitterness of the plant is extracted by soaking it in water, and it is then eaten, generally boiled with milk; a kind of bread is also made of it. The time of gathering the Iceland

moss is like a merry harvest-time. In Siberia, vast forests of firs appear; while in Kamschatka, similar forests are found of the birch. Many of the smaller plants are similar to our own. The juniper abounds, and the dog-rose, the Scotch rose, the red currant, the hawthorn, the white poplar, the mountain ash, and others, are found wild in Kamschatka as well as in our own country. On the shores of Hudson's Bay, it is said no trees are found north of 60° .

7. *The Arctic Zone* embraces a still smaller belt than the sub-arctic zone. It extends from the arctic circles to 72° lat. Its mean temperature is not certainly known; it may be at the maximum 35° Fahr.; but in the colder part of this zone it is much lower, often below the freezing point. It embraces Lapland, the Loffoden Islands, Nova Zembla, and the extreme north of Siberia, part of Greenland, and the extreme north of North America, of which very little is known; and in the southern hemisphere a few islands in 68° lat., of whose vegetation we know nothing, if, indeed, they have any. As we have witnessed the luxuriance, abundance, and splendour of the plants in the tropical parts of our globe, so we find, as we approach the poles, the reverse is the case. A green turf is not quite wanting, though only scantily seen; while vast and dreary tracts are covered with lichens, and others are occupied with immense forests of fir.

The lichens are some of the first vegetable

forms seen below the limit of perpetual snow, either in altitude or latitude. They will grow almost everywhere where they can obtain moisture, even on rocks, trees, or the barest ground. 2,400 species are known, and no plants are more widely diffused. Some produce brilliant dyes—red, orange, and brown; and one, (*Gyrophora*), the “*tripe de roche*” of arctic travellers, is employed in these regions as a miserable substitute for food. Mosses, too, accompany lichens all over the world, but especially in temperate climes; and out of 1,100 known species, a great part inhabit this zone, and constitute a large portion of the vegetation. A number of flowering plants, some of pretty and elegant forms, many of which are the same as those which grow on the alpine heights of England, Scotland, and middle Europe, here grow in the meadows and down to the sea level. They are chiefly of very low growth and large flowers. Agriculture is not altogether stopped, for, in the Scandinavian peninsula, barley and rye are cultivated; barley as high as 70° ; rye, on the western side, to 64° , on the eastern to 65° or 66° . The dry and barren fields are covered with incredible quantities of lichens, among which the rein-deer moss (*Cladonia rangiferina*) covers the most extensive surfaces with a matting, over which it is very fatiguing to travel in summer, when the plants are dried up by the perpetual sunshine.

In the elevated regions of Lapland, the trees

which are found to approach nearest the limit of perpetual snow are the dwarf birch, (*Betula nana*), and the dwarf willow, (*Salix herbacea*), though they are so small that they can scarcely be denominated trees. The dwarf birch seldom exceeds two or three feet in height, though it is said that at the island of Hammerfest, lat. $70^{\circ} 40'$, in the sheltered hollows, it rises to the height of a man. In Lapland, at the height of two thousand five hundred feet, it finds just sufficient warmth about the end of June to put forth three leaves from each bud, which, in a few weeks, wither and fall off again; but this feeble effort suffices to preserve the life of the plant. In Asiatic Siberia, north of 60° , the ground is perpetually frozen at a very small depth below the surface; a temperature of 70° below zero is not uncommon, and in some instances it has been 120° . Then it is fatal to animal life, especially if accompanied with wind. In Nova Zembla, the vegetation is so stunted that it barely covers the ground. The woody plants, such as the dwarf birch and the reticulated willow, (*Salix reticulata*), with a very few berry-bearing shrubs, trail along the ground, never rising more than an inch or two above it. The woolly-leaved willow (*Salix lanata*) is the giant of these northern forests, though it never grows more than five inches above the surface, while its trailing stem, ten or twelve feet long, lies hid among the moss.

8. *The Polar Zone*, including all above 72° of N. lat. to the pole. No trees or bushes grow

in these cold regions, where cultivation of any plant for food is impossible, for the mean temperature is far below the freezing point, and the summer lasts only from four to six weeks. Here the year is divided into one long intensely cold night and one bright and fervid day, which quickly brings to maturity the scanty vegetation. Spitzbergen and the north of Greenland are the chief lands included in it. Most of this zone is covered with perpetual ice and snow, on which no vegetable, except the singular red snow fungus, is ever found; and even on the few portions of land left uncovered by these, extreme poverty is their character, whole tracts being entirely destitute of vegetation, and in others, the little, and sometimes very pretty plants, grow in turf-like patches. Some of the plants are peculiar to the polar regions, others grow even in our own country. Some of the principal plants are species of saxifrage, poppy, rush, scurvy-grass, ranunculus, cotton-grass, willow, etc.

CHAPTER V.

Influence of altitude—Regions—Divine wisdom and benevolence—Poisonous plants—The resurrection.

THOSE who have ascended mountains, or those who have perused the narratives of the ascent of Mont Blanc, the Peak of Teneriffe, or similar elevations, must be well aware, that, be the temperature of the country at its base ever so warm, a sensible diminution of heat is felt as we rise from the plain; and in proportion to the height attained the heat diminishes, till at length an elevation is reached, at which, even in the height of summer, water remains perpetually frozen, and nought but snow and ice cover the ground. The point at which this phenomenon first occurs is called the snow line, or limit of perpetual snow. This limit is found at various heights, according to the latitude, nearness to the sea, and whatever else may affect the general climate of the place.

In the Himalayan Mountains of Asia, and the Andes of South America, the snow line is found at an elevation of 15,000 to 17,000 feet above the level of the sea; on Cotopaxi, at 15,646 feet; on Chimborazo, at 16,000 feet. More northerly, we find it, on Mount Ararat,

13,441 feet ; on the mountains of Caucasus, 10,602 feet ; on the Appenines, 9,231 feet ; on the Swiss Alps, 8,500 feet ; on the mountains of Norway and Sweden, 5,019 feet ; in Iceland, 2,642 feet ; at the North Cape, 2,275 feet ; while, near the pole itself, it is nearly on the sea level, snow and ice being there perpetual. There are, however, a few partial exceptions to this rule. The volcano of Arequipa, which rises to an elevation of 18,000 feet above the level of the sea, shows but a very little snow on one side of its highest point. In the Himalayan Mountains, in the Nutro Pass, at a height of 16,840 feet, there is no permanent snow. The whole western part of the Himalayas is as high as from 12,000 to 18,000 feet, and yet but a very little snow is seen there, and the vegetation ascends almost as high as 16,000 feet. It will be evident, therefore, on a moment's consideration, that even at the equator itself, in the midst of the torrid zone, a mountain of sufficient height may have every variety of climate at its foot, graduating into temperate in its higher regions, and this, by degrees, passing into arctic, and even a polar temperature at its summit.

Our survey of the vegetation of these various climes will have prepared us already to anticipate most of those which distinguish the various regions which succeed one another as we ascend. Our notice of each will, therefore, be very brief. We may just remark, that in some of the Andes, the whole of these regions may be seen

exemplified on a single mountain, which thus epitomizes, in a manner, the flora of the whole earth.

On mountains situated at a distance from the equator, the vegetation at their base will be the same as that of the zone in which they are situate: thus, the Peak of Teneriffe, in the sub-tropical zone, is at foot well cultivated, and produces date palms, olives, vines, plantains, etc., extending to a height of 1,200 to 1,800 feet. The second zone produces laurels, and many plants with showy flowers, and reaches the height of 5,760 feet above the sea. The third zone is the region of pines, (*Abietinæ*,) extending 2,550 feet further. Above this is a tract of broom, and then one of grasses and cryptogamic plants, scantily covering the heaps of lava. Tournefort also mentions of Mount Ararat, that at its foot were the plants of Armenia, above these such as were natives of a climate like that of France, higher still he was surrounded with Swedish species, and at the summit with polar plants.

1. We may characterize the region from the level of the sea to an altitude of 1,900 feet, (in the equatorial zone,) as that of palms and bananas corresponding with the equinoctial zone. Here we find gigantic fig trees, the innumerable offshoots of which form quite a forest, which yet remain in the closest union with the parent tree. Wherever there is a good rich soil, palms, bananas, cardamoms, and plants of the ginger tribe abound; and, in America, the *cereus* form

of cacti, and the cactus-like euphorbias, which we have before described, begin here. As the height increases, the palms become fewer, the bananas diminish in size, the ginger tribe disappear, but the orchideæ and flowering parasites become more numerous, and we approach—

2. The region of tree ferns and figs, from an altitude of 1,900 feet to 3,600 or 3,800 feet, and answering in some measure to the tropical zone. The tree ferns will not flourish, however, but in a very damp climate; in barren soil or a dry atmosphere they are quite wanting. We have already attempted to give some account of this singularly beautiful tribe of plants, which captivate the eye of every traveller in those regions. On the American mountains, the *cinchonæ* (or trees yielding Peruvian bark) here begin to appear, though they extend upwards through the two next regions as well. This plant is of very great importance in medicine, about 200,000 pounds being annually imported into this country. Quinine is extracted from it. Various species of fig, pepper, passion flowers as tall and as thick as our oaks, bread fruit, calceolarias, etc., abound in this region.

3. The region of the myrtles and laurels, from 3,800 feet to 5,700 feet. Here myrtles, camellias, magnolias, heaths, and acacias abound, and form some of the most striking features in the vegetation. The cultivation of the banana extends within this region. Trees of the fig tribe appear at the height of 3,000 feet on the mountains of Java, together with the curious

pitcher plant, rhododendrons, shrubby ferns, and orchis plants.

4. Region of the evergreen dicotyledonous trees, from 5,700 to 7,600 feet, corresponding to the warmer temperate zone. On the mountains of Java the laurel forests ascend to 7,000 feet; above this they diminish in size and beauty. Here, too, the evergreen oaks occur, the olive, and the beautiful tree heath, (*Erica arborea*.) At this altitude, on the Himalaya Mountains, scarlet and other rhododendrons grow luxuriantly; walnuts, and at least twenty-five species of oak abound, one of which (*Quercus semicarpifolia*) has a clear trunk eighty to one hundred feet high.

5. Region of dicotyledonous trees, from 7,600 to 9,500 feet, (corresponding to the colder temperate zone,) where majestic oaks and beeches are the ornaments of the forests. These trees are often wanting on the mountain heights, and, instead of them, this region is sometimes barren. Some of the fir tribe appear on the mountains in this region, but are more abundant in the—

6. Region of *Abietineæ*, (firs and pines,) extending from 9,500 to 11,500 feet. The occidental pine, which forms large forests, abounds in this region, on the mountains of Mexico; and the yucca, or Adam's needle, forms whole woods in the same parts of that country, single plants rising to the height of thirty feet. Agaves and some species of cactus also abound, with oaks, and some species of arbutus, (strawberry

tree.) On the Peak of Teneriffe, which is in the sub-tropical zone, this region extends to 8,000 feet. On the Appenines and Alps, it extends from 3,800 feet to 5,700 feet. On the Harz Mountains, in Germany, it does not reach beyond 3,800 feet, while in the sub-arectic zone it only ascends to 1,200 feet.

7. Region of rhododendrons, or lower alpine region, from 11,500 to 13,300 feet. The rhododendrons, which are well known in almost every garden, are the special ornaments and features of this region, and abound in almost every district of it in Europe. One of the common species (*Rhododendron ponticum*) is said to have been the plant from which the bees of Pontus collected the honey that produced the extraordinary symptoms of poisoning, described as having attacked the Greek soldiers in the famous retreat of the ten thousand. Xenophon says, that after eating it the men fell stupified in all directions, so that the camp looked like a battle-field strewn with corpses. Dwarf species of willow also abound in this region.

8. Region of alpine plants, which grow from the upper limit of the last region up to the line of perpetual snow, where all vegetation ceases. Most of the alpine plants are perennial, and many of them are singularly tenacious of life. Many of them are beautiful plants, especially the brilliant gentians, which are the glory of alpine heights ; there are some species, which cover the sides of hills with blossoms of

such intense brilliancy that the eye can scarcely, rest upon them. A great variety of plants, with large blossoms, adorn the heights of this region, among which are prominent the lovely anemones, various species of primroses, etc., and on the South American mountains, mimulus, (monkey flowers and musk plants,) calceolarias, lupins, and several species of sida, a genus allied to the mallows, but with remarkably beautiful and large flowers.

“ Tree nor shrub,
Dare that drear atmosphere : no polar pine
Upstairs a veteran front : yet there ye stand
Leaning your cheeks against the thick ribb'd ice,
And looking up with brilliant eyes to Him
Who bids you bloom, unblanched, amid the waste
Of desolation.”

We have now glanced rapidly at the wonderful diversity of vegetable life with which our bountiful Creator has clothed this earth, and have endeavoured to explain the most important of the known causes which regulate their distribution. But, however interesting such inquiries may be, there remains for our consideration the great practical lessons which these investigations properly suggest, and without a due regard to which all scientific pursuits are “vanity.” We see exemplified, in a very remarkable manner, the goodness and wisdom of our heavenly Father. How wonderfully varied are the vegetable productions of our globe, and how marvellous is the wisdom which, out of one form of life, can produce so astonishing a number of species, performing

functions of such essential importance in the economy of the globe, and ministering so extensively to the necessities, comforts, and pleasures of the creatures that inhabit it! How amazing is the law by which the whole vegetable kingdom becomes, by the functions of respiration and assimilation, the purifier and preserver of the atmosphere! Infinite wisdom is apparent everywhere; and how lamentable is it, that so many scientific men should endeavour, by a philosophy "falsely so called," to account for the wonders of our world without reference to a Creator: so true is the Scripture, "They did not like to retain God in their thoughts." These insidious arguments are continually being advanced, both in Germany and our own country, by men of high scientific reputation; but it becomes us to receive their statements with caution, remembering that the works of God can never contradict his word. Infinite benevolence, too, is as apparent as perfect wisdom. The distribution of the plants most useful to man over our globe, is such as is calculated, in the best possible manner, to develop commercial relations. Thus, while nations are rendered dependent on one another for many necessities, a means is afforded, by the constant communications thus required, for the rapid extension of religion and civilization to distant countries, while this mutual dependence makes the preservation of peace their interest. The distribution of the food plants of our globe, and the

precise adaptation of the species which succeed best in each country to the wants and condition of its inhabitants, are most beautiful instances of His providence, who "giveth food to all flesh : for his mercy endureth for ever." While many of the comparatively less important fruits, such as the orange, banana, mango, peach, cocoa-nut, etc., are more restricted in their limit of growth, few plants have such a range as the most important of the *cerealia*—wheat and barley. And as God has so formed our bodies that bread is to be their main support, so he has given to the corn plants a capability of bearing extremes of temperature which few other plants possess. Surely this may teach us to trust in him for our daily wants, for while such a supply is made for man and beast, he who thus feeds the fowls of the air and the beasts of the field will never suffer his children to want any needful good.

This abundant and suitable provision made for the food of man in the vegetable kingdom, may also lead us to think of that "Bread which came down from heaven," of which, if a man eat, he shall live for ever ; for surely, if we require daily food to support our bodies, our souls stand in greater need of constantly living by faith on Jesus Christ, the Son of God. While our fervent prayer is, "Lord, evermore give us this bread," let us regulate our expectations by the assurance, that the same bounty which is displayed in creation is engaged also in dispensing the riches of grace ; nor is the supply

thus mercifully afforded less suited to promote our spiritual health and happiness, than is our daily bread to the nourishment of the body. Nor is this the only analogy suggested by a view of those benevolent arrangements of the Creator, which we have been contemplating. Most of our best medicines are derived from plants, and the large number of these, in almost all countries, is a remarkable proof of the goodness of God, in thus providing for the cure or relief of the many maladies to which the human frame is liable. It is worthy of notice, that some of the most active medicinal plants are very abundant in those countries in which the diseases for which they are efficacious are chiefly prevalent ; such as the Peruvian and winter's bark, in South America, and others. Who can forget, in connexion with these facts, the prophet's earnest appeal—"Is there no balm in Gilead? is there no physician there? why then is not the health of the daughter of my people recovered?" Of all the diseases that affect the body of man, none is so awful in its consequences, or so deeply seated in its nature, as that of sin in the soul ; and if the remedy be not applied, this malady will prove inevitably fatal. But there is a remedy—a sovereign specific—an unfailing cure—and it is this, 'The blood of Jesus Christ cleanseth from all sin. Every soul is afflicted with this disease, and for every soul is the remedy provided. There is no other ; "for there is none other name under heaven given among men, whereby we must be saved"—

“Believe in the Lord Jesus Christ, and thou shalt be saved.”

Notwithstanding the marks of the Divine goodness and bounty that are everywhere manifest in the vegetable kingdom, there is, nevertheless, much which shows us that this is a fallen world—the abode of fallen creatures. Why, else, do we see the numerous tribes of poisonous plants, eliminating their deadly juices, ready to deal death and destruction to every one who tastes them? How, else, can we reconcile the presence of such plants as the ipas, the manchineel, the panghinia of Madagascar, the woorali of South America, the dumb cane, the frightful nettles of Java, and a multitude more, in a world which abounds in proofs of the Divine love and mercy? God has stamped the inscription upon the globe, in characters which all may understand, but which none can erase, that man is a fallen creature—that he has incurred his Maker's frown; while yet that Creator in wrath remembers mercy, and still provides food and comforts for the creatures who have rebelled against him.

The universal decay of plants, their death at the appointed time—and in these latitudes the fall of the leaf from most of our trees reminds us of our own mortality. “As for man, his days are as grass: as a flower of the field, so he flourisheth. For the wind passeth over it, and it is gone; and the place thereof shall know it no more.”

“ We have short time to stay as you,
We have as short a spring;
As quick a growth to meet decay,
As you or any thing :
We die
As your hours do, and dry
Away,
Like to the summer rain,
Or as the pearls of morning dew,
Ne’er to be found again.”

May these, then, instruct us, and may God “ so teach us to number our days, that we may apply our hearts unto wisdom ! ”

But if this constant decay and death should vividly impress on our minds the fact of our own mortality, how beautifully does the approach of spring illustrate the doctrine of the resurrection ! It has been well remarked, that, in some tropical countries, where winter does not come, and where the leaves do not fall as with us, the want of the vivid beauty of spring, when the trees and flowers burst from a state of apparent death into all the loveliness of foliage and flowers, is painfully felt by an English traveller. We, to whom such a scene is familiar, can understand how beautiful a picture it gives us of the day when the dead shall arise, and when we shall all be changed—the corruptible bodies of the righteous to incorruptible ones, glorious like their Saviour, purified from every deadly stain, infirmity, or passion. Nor must we omit to notice a fact, of which the apostle Paul makes so sublime an application—the growth of the seed. “ That which thou sowest is not quickened, except it die : and that which thou sowest, thou sowest

not that body that shall be, but bare grain, it may chance of wheat, or of some other grain : but God giveth it a body which it hath pleased him. So also is the resurrection of the dead. It is sown in corruption ; it is raised in incorruption : it is sown in dishonour ; it is raised in glory : it is sown in weakness ; it is raised in power : it is sown a natural body ; it is raised a spiritual body."

To a mind daily influenced by the truths of Divine revelation, how many aids to reflection are furnished by these striking analogies, of which not only prophets and apostles availed themselves, but which are rendered still more sacred by our Lord's application of them, in illustration of his doctrines !

While we may learn much from nature, and with the light of the gospel much more, it is by this gospel alone that we are told of the way of reconciliation with God—of an atonement for sin. Here, alone, we have the tidings of full and free salvation, through a crucified Redeemer—the truth that, though utterly helpless and undone in ourselves, God has laid help upon One that is mighty to save, who gave himself up to bear our sins, and to die for us upon the cross, that we might be saved. Here, only, do we learn that we are "not justified by the works of the law," but by faith in Jesus Christ ; and here we have the promise of the Holy Spirit, to sanctify our hearts, and make us "meet for the inheritance of the saints in light." These are

truths that the book of nature could never teach us. Let us be thankful, therefore, that we are not left to it, but that "life and immortality" are brought "to light through the gospel." May we be made "wise unto salvation, by faith which is in Christ Jesus;" then, being reconciled to God by the death of his Son, we can calmly contemplate the frail and fading scenes of earth, with the assurance that there "remaineth a rest for the people of God." In that world sin, sorrow, and death can never enter; and the loveliest scenes below suggest the thought,

" If God hath made this world so fair,
Where sin and death abound,
How beautiful beyond compare
Will paradise be found."

And just as the hope of the Christian is glorious and full of immortality, proportionably desolate, dreary, and fearful, is the prospect of those who live without God in the world—who have not made their peace with him, through Christ. To such, the resurrection and a future state are invested with terrors passing the utmost stretch of human thought. Oh, may all who read this volume be wise to seek salvation while it is to be found!